INTERIM TAX REPORTING ACCURACY

A Dissertation

by

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ABSTRACT

APB 28, *Interim Financial Reporting*, requires firms to report tax expense each quarter based on their estimated annual effective tax rate (ETR); however, due to both bias (e.g., downward manipulation) and estimation error, these estimates do not always accurately represent annual ETR. I exploit the requirements in APB 28 to examine the determinants of tax reporting accuracy and the effect of prior tax reporting accuracy on investor reaction to reported tax expense. Consistent with a monitoring role over financial reporting, I find that analyst following, institutional ownership, and auditor tenure are positively associated with interim tax reporting accuracy. I also document several firm characteristics that are negatively associated with interim tax reporting accuracy but have no association with bias, suggesting that these factors significantly contribute to estimation error within the tax accounts. Importantly, I find that estimated taxable income is more informative to investors as a performance measure for firms that have been more accurate in prior years, and that investors respond more positively to beating analysts' forecasts using a decrease in the tax rate when the firm has a record of accurate tax reporting.

DEDICATION

I dedicate my dissertation work to my family. I am forever grateful for their love and support. To my wife, Elizabeth, for taking a risk with me and never ceasing to encourage me. To my children Benjamin, Charlie, and Katie for being incredible motivators. And to my parents, Peter and Crystal, who taught me to always do my best.

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I. INTRODUCTION

Information in accounting earnings results in increased trading volume, stock price volatility, and abnormal stock returns, consistent with accounting earnings providing useful information to investors (Beaver 1968; Ball and Brown 1968). However, certain characteristics make financial information more or less useful. FASB Concepts Statement No. 8 states, "If the level of uncertainty in [an estimate] is sufficiently large, that estimate will not be particularly useful." One such estimate that is material for a broad set of firms is the estimated GAAP effective tax rate (ETR) reported during interim periods (Dhaliwal et al. 2004). Prior studies have examined the potential bias of interim ETR estimates (Comprix et al. 2012); however, due to the complexity of the tax accounts these estimates also contain significant estimation error, resulting in inaccurate estimates. Although the tax accounts are one of the most complex areas of financial reporting (Graham et al. 2012) and are among the most restated accounts (Deloitte 2011; Whalen and Usvyatsky 2014), suggesting taxes are not always accurately reported, we currently know little about the determinants of tax reporting accuracy and whether it is important to investors. In this study, I examine three factors that may contribute to interim tax reporting accuracy: 1) complexity in the tax estimation process, 2) the role of institutional investors and financial analysts, and 3) characteristics of the auditor. I further examine whether investor response to reported tax expense varies with prior tax reporting accuracy.

I define interim tax reporting accuracy as the precision with which reported interim ETRs predict the annual ETR. ASC 740-270-30 states, "At the end of each

interim period the company should make its best estimate of the effective tax rate expected to be applicable for the full fiscal year." Therefore, the ETR reported in each quarter is management's best estimate of annual ETR. However, because there is significant complexity, judgment, and uncertainty involved in reporting tax expense (Graham et al. 2012), there is likely significant estimation error in the tax accounts.[1] Despite numerous studies that acknowledge the difficulty and uncertainty surrounding tax reporting, the determinants and consequences of tax reporting accuracy have not been examined comprehensively in prior academic work.[2]

It is important to examine the determinants of interim tax reporting accuracy for at least four reasons. First, changes in tax rates can be substantial in magnitude, thereby producing significant changes in reported after-tax earnings. For example, Comprix et al. (2012, page 41) report that the standard deviation of changes of estimated ETRs from first to second, second to third, and third to fourth quarter are 6.0, 6.9, and 8.7 percent, respectively, in their post-SOX sample. Using the federal statutory tax rate of 35 percent as a baseline, these standard deviation changes effectively change after-tax earnings by 9.2, 10.5, and 13.4 percent, respectively.[3] Thus, subsequent correction of ETR estimates can have a significant effect on after-tax earnings.

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[1] Because firms are required to project ETR for the annual period, this definition of accuracy includes unforeseen changes in the firms' operating environment and forecast error; this component adds to the difficulty of providing accurate ETR estimates during interim periods.

[2] In a related study, Bratten et al. (2016), examine how analysts use and improve upon management ETR forecasts; in Section II I discuss similarities and differences between my study and theirs.

[3] For example, the first quarter standard deviation of 6.0 percent changes after-tax earnings by 6.0/(1-0.35) = 9.2 percent.

Second, prior academic work suggests that ETR estimates are systematically biased and can be manipulated in order to reach after-tax earnings benchmarks (e.g., Dhaliwal et al. 2004; Comprix et al. 2012). While these studies focus on the systematic decrease of ETRs to manage earnings, they also provide descriptive evidence that many firms *increase* ETRs throughout the year, suggesting significant estimation error in addition to bias.[4] Because ETR accuracy is a function of both estimation error and bias (i.e., both contribute to inaccuracy of ETR estimates), I separate these factors to examine estimation error more directly. That is, the factors associated with ETR *accuracy* (i.e., absolute difference between the estimate and year-end ETR) but not ETR *bias* (i.e., systematic signed differences between the estimated and year-end ETR) contribute to ETR estimation error (i.e., unbiased errors in ETR reporting). Thus, by examining both accuracy and bias I provide insight into factors that contribute to ETR estimation error.

Third, ETR changes are important to firm managers. Graham et al. (2014) report that 84 percent of tax executives rate the GAAP ETR at least as important as cash taxes paid. Further, the Tax Executive Institute (TEI) (2011-2012) Corporate Tax Department Survey indicates the most common measurement used to evaluate the tax departments is "lack of surprises." In my discussions with several Big 4 tax partners, they indicated that both earnings increasing and earnings decreasing ETR surprises tend to be viewed negatively by investors because they provide signals about the credibility of the tax

[4] For example, Bratten et al. (2016) find that quarterly ETR increases occur nearly as frequently as ETR decreases; I argue this is due at least in part to estimation error and the difficulty of accurately estimating tax expense.

department; even an ETR surprise that has a positive effect on earnings could be viewed as "lucky" and interested parties may question whether there will be future surprises that will have a negative effect on earnings. To the extent that surprises in ETR are revealed through inaccurate interim ETR estimates, my study is directly related to one of the most important measurements used to evaluate tax departments.

Fourth, ETR estimation accuracy could provide a signal regarding the level of uncertainty and potential error in the tax accounts and could therefore have significant implications for how the market understands and responds to the reported information. For example, investors are interested in the persistence of earnings but often underweight the persistence of the tax change component of earnings (Schmidt 2006). I assert that firms may differ in the reliability of reported ETRs, contributing to the difficulty in assessing the persistence of ETR changes and creating heterogeneity in users' response to reported tax expense (i.e., firms with more accurate tax reporting likely have stronger reaction due to the increased reliability of the amount reported). Consistent with this point, Bratten et al. (2016) find that better information about tax expense reduces analysts' forecast dispersion and could therefore have implications for the cost of capital.[5]

I investigate three distinct factors that could be associated with interim tax reporting accuracy. First, I examine firm characteristics that may create tax estimation

[5] Relatedly, McGuire et al. (2015) provide preliminary evidence that variability in interim ETR estimates is associated with lower financial reporting quality, as observed by a higher likelihood of restatements and internal control weaknesses.

complexity. Prior research suggests that accounting for income taxes (AFIT) is one of the most complex areas of financial reporting (Graham et al. 2012). Given the considerable variation in ETRs among firms (Dyreng et al. 2008), significant changes in quarterly ETRs (Bauman and Shaw 2005; Comprix et al. 2012), and potential information content in the tax accounts (e.g., Lev and Nissim 2004; Hanlon 2005; Ayers et al. 2009; Blaylock et al. 2012; Thomas and Zhang 2014), it is important to document what specific factors contribute to ETR estimation accuracy.

Second, I examine the role of institutional investors and financial analysts. Prior research suggests institutional owners and analysts can serve a *monitoring* or a *pressure* role over financial reporting. Institutional owners serve as monitors who improve the accuracy of voluntary earnings forecasts (e.g., Ajinkya et al. 2005); however, prior research suggests investors place pressure on managers to meet earnings targets, leading to more biased and less accurate estimates (Comprix et al. 2012) . My study extends this research by testing whether institutional owners serve a monitoring or pressure role for a specific *mandatory* disclosure (i.e., interim tax reporting). Prior research suggests analysts can serve a monitoring role by scrutinizing management behavior (e.g., Chung and Jo 1996; Chen et al. 2015), which affects corporate decisions such as investing and financing policies (Derrien and Kecskés 2013), innovation (He and Tian 2013), and tax avoidance (Allen et al. 2015). However, managers are also pressured by analysts to meet optimistic earnings targets (Habib and Hansen 2008), leading to potential manipulation of tax expense in order to meet these targets (Dhaliwal et al. 2004). I extend this line of research by examining whether financial analysts serve a monitoring role that improves

the accuracy of interim ETR estimates or a pressure role that leads to more biased, less accurate estimates.

Third, I investigate the association between auditor characteristics and interim tax reporting accuracy. SEC Regulation S-X (Article 10) requires that an independent accountant review interim financial statements, potentially improving the credibility of the reported ETR (Bauman and Shaw 2005). Prior research suggests that certain auditor characteristics are associated with higher audit quality; however, a review substantially differs from an audit and the tax accounts are a challenging area for tax departments and auditors (Deloitte 2011), so it is an empirical question as to whether these characteristics also improve interim tax reporting accuracy via the interim review process.

I next examine whether investor response to information in the tax accounts varies based on prior tax reporting accuracy. Hanlon et al. (2005) provide evidence that estimated taxable income can serve as an alternative performance measure to pre-tax book income and provides incremental information to the market regarding the performance of the firm. I extend this analysis by examining whether the investor reaction to estimated taxable income as a performance measure varies with prior tax reporting accuracy. Gleason and Mills (2008) use a short-window market test and find that the reward for beating analysts' target is significantly discounted for firms that beat the target by decreasing ETR from third to fourth quarter. I extend this analysis by examining whether the discount varies based on prior tax reporting accuracy.

My results indicate that analyst following, institutional ownership, and auditor tenure are positively associated with interim tax reporting accuracy, consistent with a

monitoring role that improves the accuracy of ETR estimates. My results also indicate that geographic complexity, changes in geographic mix of income, discontinued and extraordinary items, deferred tax assets, and R&D activity are negatively associated with interim tax reporting accuracy. However, these factors are not associated with ETR bias, suggesting the observed effect on accuracy is due to these factors' association with estimation error of ETR estimates.

Further, I document that the relation between stock returns and changes in estimated taxable income is increasing with prior tax reporting accuracy, even while controlling for the change in taxable income itself. This result is consistent with investors perceiving estimated taxable income as a more reliable performance measure when the firm has a record of tax reporting accuracy in recent years. I also document a significant market discount for using a decrease in tax expense to beat analysts' forecast, consistent with the result in Gleason and Mills (2008); however, I observe no market discount for firms that use tax expense to beat analysts' forecast that have a history of accurate tax reporting. Taken together, these results provide evidence that investor use of the reported tax expense significantly varies with prior tax reporting accuracy.

My study contributes to the tax, earnings quality, corporate governance, and audit literatures. I document the extent to which interim ETR estimates, a material item for most firms, conform to the annual ETR as well as several factors that contribute to ETR accuracy. I contribute to the audit literature by providing evidence that auditor tenure is associated with improved interim ETR accuracy, consistent with a more effective interim review process when the auditor has a continuing relationship with the

client. My study also contributes to the earnings quality and corporate governance literatures by showing that analysts and institutional owners serve a monitoring role that improves interim tax reporting accuracy, rather than a pressure role that would lead to manipulation and less accurate ETR estimates. I also show that investor response to information reported in the tax accounts differs based on prior tax reporting accuracy. My results provide insight into how the market values the information in the tax accounts and therefore contributes to the literature examining the pricing of tax information reported in the financial statements (Graham et al. 2012). Overall, my study should interest investors, corporate managers, auditors, academics, and other users of financial statements because it provides insight into the reliability of tax expense estimates, a material expense for a broad set of firms.

II. BACKGROUND AND HYPOTHESES

Interim Tax Reporting

APB Opinion No. 28, *Interim Financial Reporting*, requires companies to estimate *annual* ETR based on facts and circumstances known at each interim period and to allocate tax expense on a *pro rata* basis under the integral method.[6] The estimated ETR should reflect anticipated investment tax credits, foreign tax rates, percentage depletion, capital gains rates, and other tax planning alternatives, but unusual or extraordinary items should be separately reported or reported net of their related tax effect (ASC 740-270-30-8). Under this method, the year-to-date ETR each quarter should reflect year-to-date activity as well as management's *forecasted* activity for the remainder of the year, providing a point estimate of management's forecasted ETR.[7] Because firms are to include anticipated tax planning in their estimate, even managerial actions that cause the ETR estimates to deviate from year-end ETR still fall under my definition of accuracy.[8] I provide an example of this computation in Appendix B.

These point estimates may not accurately represent the actual annual ETR for a variety of reasons, and I acknowledge that users are likely interested in the underlying

[6] The integral method applies to other accounts such as cost of goods sold; however, because the people and processes involved in preparing ETR estimates substantially differ from other accounts (Choudhary et al. 2015), I am cautious about extending my inferences beyond the tax accounts and overstating my conclusions.

[7] A notable exception is when firms have "discrete" items that must be recorded fully in the quarter they occur, potentially distorting the role of interim ETRs representing predicted annual ETR. In Section V, I re-run my analyses using only firm-quarters free of discrete items and my inferences are unchanged.

[8] I note that even if inaccuracy is caused by a firm consistently changing its tax planning strategy (i.e., intentional managerial actions), then users will likely find the current reported information less useful in assessing the current and future tax position of the firm.

reason for the change and may react to the information differently based on this information.[9] However, with limited information provided during interim periods[10], the reported interim ETR (and subsequent changes to it) could serve as a summary measure regarding the tax position of the firm. As Graham et al. (2012) note, the purpose of reported tax expense is to accurately portray the current financial performance of the firm; I assert that the accuracy with which firms report interim tax expense can serve as a valuable signal regarding the extent to which reported tax expense serves this purpose. When firms are consistently less accurate in reporting their ETR than other firms, their reported tax expense is likely less reliable.

Prior academic research has examined interim tax reporting in different ways. Dhaliwal et al. (2004) report that firms use tax expense as an earnings management tool by decreasing ETRs from third to fourth quarter when they would have missed analysts' forecast using third quarter ETR. Comprix et al. (2012) document that quarterly ETR estimates are systematically biased upward, creating "slack" that can be used to manage earnings. Bauman and Shaw (2005) find that interim ETR disclosures are useful in predicting future earnings, but both financial analysts and investors generally under-utilize this information. Schmidt (2006) finds that initial "tax change component" of earnings is more persistent than the revised tax change component, but the market

[9] My discussions with practitioners and personal institutional knowledge suggest that the most common reasons for ETR changes are changes in mix of foreign and domestic income, tax credits, changes in tax reserves, settlements with taxing authorities, and changes in valuation allowance.

[10] Firms are not required to provide a rate reconciliation during interim periods, and often provide boilerplate statements (e.g., primarily due to mix of foreign income) regarding reasons their ETR deviates from the statutory rate or prior year's ETR; however, disclosure practices significantly vary by firm.

underweights the forecasting implications of the tax change component.[11] Taken together, these studies suggest that quarterly ETR estimates significantly change throughout the year and the changes are often material in amount; however, users do not appear to fully utilize the forecasting implications of changes in ETR. I argue that heterogeneity in tax reporting accuracy is associated with the reliability of the estimates and could therefore provide an explanation for variation in investor use of the information.

In a concurrent study, Bratten et al. (2016) examine how analysts use management interim ETR estimates. They find that complexity and discrete items impair management's ETR accuracy, analysts are more likely to mimic management's ETR estimate when management is more accurate, and analysts' ETR and EPS forecasts are less disperse when management's estimate is more accurate. Although related, my study differs from theirs in several important ways. First, while they focus on analysts' use of management's reported ETR, I examine investors' use. Second, I examine both accuracy and bias of management ETR estimates, which provides insight into the factors that affect accuracy through either bias or estimation error. Third, my analysis includes both institutional ownership and auditor characteristics because of the potential influence these parties may have on management's reported ETR estimate. Because of these

[11] The "tax change component" of earnings is the earnings generated by changes in effective tax rates. The initial tax change component is the change in earnings due to a change in ETR from prior year to the first quarter of the current year; the revised tax change is the change in earnings due to changes in ETR from the first quarter in the current year to the end of the current year.

differences, my study complements theirs and provides additional contributions to our knowledge regarding financial reporting of tax expense.[12]

Complexity and Interim Tax Estimates

Accounting for income taxes is one of the most complex areas in financial reporting (Graham et al. 2012) and the tax accounts are among the most restated accounts (Deloitte 2011; Whalen and Usvyatsky 2014). While prior research acknowledges this complexity and its implications for managerial bias in an earnings management context (e.g., Dhaliwal et al. 2004; Cook et al. 2008; Comprix et al. 2012; Christensen et al. 2015), a significant portion of ETR changes are income *decreasing*, suggesting a large amount of estimation error in addition to bias.[13] To date, we know little about how estimation error affects ETR accuracy, what factors are associated with accuracy, or whether accuracy is associated with investor use of the information in the tax accounts.

It is important to document which factors contribute to estimation error in ETR estimates because estimation error is an important element of earnings quality (McNichols 2002). For example, in the context of accruals, Dechow and Dichev (2002, page 36) argue that "estimation errors and their subsequent corrections are noise that

[12] In addition, I examine accuracy of each quarter (i.e., first, second, and third quarters) relative to year-end rather than next quarter because each quarter's estimation is intended to represent year-end ETR.
[13] The studies cited above examine tax expense changes generally (i.e., through changes in total ETR); other studies examine earnings management using specific tax accounts, such as the valuation allowance (e.g., Miller and Skinner 1998; Visvanathan 1998; Bauman et al. 2001; Schrand and Wong 2003; Frank and Rego 2006), uncertain tax positions (e.g., Gupta et al. 2015; Cazier et al. 2015), and permanently reinvested foreign earnings (e.g., Collins et al. 2001; Krull 2004).

reduces the beneficial role of accruals." More generally, inaccuracy reduces the reliability, usefulness, and therefore quality of amounts reported in financial statements.

Financial Analysts

Prior research suggests financial analysts play a monitoring role by scrutinizing management behavior and disseminating information, improving transparency (e.g., Jensen and Meckling 1976; Healy and Palepu 2001; Chen et al. 2015). In concurrent work, Allen et al. (2015) find analyst coverage is associated with reduced corporate tax avoidance, consistent with a monitoring role. However, managers are also pressured by analysts to meet optimistic earnings targets (e.g., Healy and Wahlen 1999; Bartov et al. 2002; Graham et al. 2005; Habib and Hansen 2008). This pressure leads to decreases in ETR from third to fourth quarter as a way to meet analysts' earnings forecasts (Dhaliwal et al. 2004). Based on the above arguments, analyst coverage could increase interim tax reporting accuracy through increased scrutiny (Chen et al. 2015) or decrease interim tax reporting accuracy through pressure to meet earnings targets, leading to building of "slack" and subsequent earnings management (Comprix et al. 2012).

On the other hand, analysts may have no effect on interim tax reporting accuracy. Research suggests that analysts do not incorporate complex tax information in their estimates (Plumlee 2003) and fail to fully consider income shifting from high tax rate to low tax rate years (Shane and Stock 2006). In addition, Weber (2009) finds that analysts' forecast errors are systematically associated with book-tax differences, suggesting they do not incorporate all available tax information into their earnings forecasts. At the same time, Bratten et al. (2016) find that individual analysts' ETR forecasts differ from

management estimates 74% of the time, suggesting analysts exert significant effort to understand complex tax situations. However, if ETR estimates are sufficiently complex, analysts may not be able to successfully serve as a monitor over the tax accounts. Therefore, it is an empirical question whether analyst coverage is associated with interim tax reporting accuracy. I state my first hypothesis as follows:

H1: Analyst coverage is not associated with interim tax reporting accuracy.

Institutional Ownership

Prior research suggests that institutional investors serve a monitoring role in mitigating agency problems between shareholders and managers (e.g., Hartzell and Starks 2003) and curbing myopic behavior such as cutting R&D to reverse an earnings decline (Bushee 1998) or earnings management through discretionary accruals (Rajgopal and Venkatachalam 1997; Shang 2003). Ajinkya et al. (2005) note that "institutions consistently probe the company for more specific, unbiased, and accurate information about future earnings." Consistent with this notion, they find that institutional ownership is positively associated with the likelihood of forecast occurrence and that the forecasts are more specific and accurate. Based on the evidence that institutional owners demand specific, unbiased, and accurate information, I expect a positive association between institutional ownership and interim tax reporting accuracy.

However, managers may provide their best estimate of annual ETR with or without monitoring by institutional owners. In addition, the firm's tax position may be so complex that institutional owners may not be able to successfully demand more accurate information. If that is the case, I expect no relation between institutional ownership and

interim tax reporting accuracy. Finally, high institutional ownership may place pressure on management to decrease ETRs and/or avoid increases in ETR, resulting in more biased and less accurate interim ETR estimates. Therefore, based on the above arguments I state my second hypothesis in null form:

H2: Institutional ownership is not associated with interim tax reporting accuracy.

Auditor Characteristics

Auditors play a role in the interim financial reporting process. SEC Regulation S-X (Article 10) requires interim financial statements to be reviewed by an independent accountant, potentially improving their reliability (Manry et al. 2003; Bauman and Shaw 2005). Specifically related to the tax accounts, auditors examine the basis for estimated book-tax differences and inquire about discretionary items as part of their review (Bauman and Shaw 2005). Because ETRs can materially affect reported earnings (Schmidt 2006; Comprix et al. 2012), are among the most restated accounts (Plumlee and Yohn 2010; Deloitte 2011), and require significant estimation and judgement (Dhaliwal et al. 2004; Choudhary et al. 2015), the tax accounts are likely among those that receive auditor attention during the interim financial statement review.[14]

Prior research examines auditor characteristics and their association with audit quality. This line of research suggests that larger audit offices, industry expert auditors,

[14] Other review procedures performed by the auditor may include comparing forecasts to actual results, comparing results to entities in the same industry, and examining ratios such as inventory turnover and expenses as a percentage of sales. Specific examples of additional situations where the auditor would ordinarily inquire of management include M&A, revenue recognition, impairment, and derivatives (AU Section 722).

longer auditor tenure, and Big N auditors are associated with higher audit quality.[15] Prior research also suggests that auditor-provided tax services (APTS) provide "knowledge spillovers" and are associated with improved financial reporting quality (e.g., Kinney et al. 2004; Robinson 2008; Krishnan and Visvanathan 2011), fewer tax-related restatements (Seetharaman et al. 2011), and fewer tax-related internal control weaknesses (DeSimone et al. 2015). Gleason and Mills (2011) provide evidence that firms that purchase APTS are fully reserved for IRS disputes, while firms that don't purchase APTS are not.[16]

Thus, prior research suggests that a number of auditor characteristics are associated with improved audit and financial reporting quality. However, a review of interim reports substantially differs from an audit. An audit includes significant testing through inquiry, physical observation, third-party confirmation and other procedures in accordance with generally accepted auditing standards. On the other hand, the purpose of a review is to "provide the accountant with a basis for communicating whether he or she is aware of any material modifications that should be made…to conform to the applicable financial reporting framework"; a review primarily involves analytical procedures and inquiries of management, rather than search and verification procedures

[15] Francis and Yu (2009) examine audit office size; Ferguson et al. (2003), Francis et al. (2005), and Reichelt and Wang (2010) examine industry expertise; Carcello and Nagy (2004), Knechel and Vanstraelen (2007), Myers et al. (2003) examine auditor tenure; see DeFond and Zhang (2014) for an in-depth review of archival audit research.

[16] I am aware of only one study that finds a negative association between APTS and financial reporting quality. Choudhary et al. (2014), find a *negative* association between APTS and tax accrual quality. In addition, Lennox (2015) finds no change in rate of tax misstatements among firms that reduced APTS after additional PCAOB restrictions, consistent with APTS having no effect on tax financial reporting quality.

(AU 722). Therefore, it is unclear whether auditor characteristics that are associated with improved audit quality are associated with improved *reviews*, and whether this translates to more accurate or less biased ETR estimates. Therefore, I state my third hypothesis in null form:

> **H3:** Auditor characteristics are not associated with interim tax reporting accuracy.

Estimated Taxable Income as a Performance Measure

Financial Accounting Concepts Statement No. 8 states that the fundamental qualitative characteristics of useful financial information are *relevance* and *faithful representation*. Information is *relevant* if it is capable of making a difference in decisions by users and has predictive value, confirmatory value, or both. Regarding *faithful representation*, the FASB states the following:

> "To be useful, financial information not only must represent relevant phenomena, but it also must faithfully represent the phenomena that it purports to represent. To be a perfectly faithful representation, a depiction would have three characteristics. It would be *complete*, *neutral*, and *free from error*. Of course, perfection is seldom, if ever, achievable. The Board's objective is to maximize those qualities to the extent possible." (FASB 2010, page 17)

Although ETR estimates may be made faithfully by management using the best available information, they are rarely perfect representations of annual ETR (i.e., the "phenomena that it purports to represent"). In addition, Comprix et al. (2012) document that ETR estimates are systematically biased, meaning they are not always neutral. I argue that when users of financial statements consistently observe significant error in interim ETR estimates, it could serve as a meaningful signal regarding the reliability of the tax expense reported by the firm.

Prior academic research has demonstrated that estimated taxable income, calculated using information in the financial statements, provides information to the market that is incremental to pretax book income (Hanlon et al. 2005; Ayers et al. 2009). However, estimation error in financial statement information creates noise that reduces the beneficial role of the information (Dechow and Dichev 2002), and this noise reduces the price reaction to the signal (Holthausen and Verrecchia 1988; Kothari 2001; Hanlon et al. 2008). Therefore, I examine whether the information contained in the tax accounts varies by prior interim tax reporting accuracy, a proxy for potential estimation error, and whether the market differentially impounds the information into stock prices. Consistent with ETR inaccuracy being associated with noise in the tax accounts, I predict that greater prior interim tax reporting accuracy will improve the reliability of information in the tax accounts and this information will be more fully reflected in stock prices. Therefore, I state my fourth hypothesis as follows:

> **H4:** Firms with high prior ETR accuracy have more useful information contained in the tax accounts.

III. RESEARCH DESIGN

Determinants of Interim Tax Reporting Accuracy

I examine my research question and test my first three hypotheses by estimating the following equation:

$$ACCURACY_{it} = \beta_0 + \beta_{1-2}\sum ANALYST_{it} + \beta_3 IO_{it} + \beta_{4-8}\sum AUDITOR_{\text{it}} + \beta_{9-23}\sum FIRM\_FACTORS_{it} + \beta_k INDUSTRY_i + \beta_j YEAR_t + \varepsilon_{it} \quad (1)$$

The dependent variable is the absolute value of the difference between year-end ETR and the year-to-date ETR from the first, second, and third quarter (*ACCURACY1*, *ACCURACY2*, and *ACCURACY3*, respectively). I multiply this value by negative one so larger values indicate greater interim tax reporting accuracy.[17] Examining the accuracy of all three quarters allows me to test which factors systematically affect ETR accuracy throughout the year. I also examine factors associated with ETR *bias* by estimating Equation (1) after replacing *ACCURACY* with the signed difference between year-end ETR and the year-to-date ETR from the first, second, and third quarter ($\Delta Q1Q4$, $\Delta Q2Q4$, and $\Delta Q3Q4$, respectively), where positive values indicate an increase in ETR from quarter *q* to year-end ETR. As noted previously, I interpret factors associated with *accuracy* but not *bias* as likely contributors to *estimation error*.

ANALYST consists of two variables related to analyst coverage. First, I include the number of analysts following the firm (*AF*) following prior research (He and Tian

[17] This calculation is similar to the body of research that examines management forecast accuracy (e.g., Hirst et al. 2008; Feng et al. 2009; Bamber et al. 2010; Baik et al. 2011; Billings et al. 2014; Goodman et al. 2014).

2013; Allen et al. 2015). H1 does not predict a direction on the sign of the *AF* coefficient estimate; however, a positive coefficient would be consistent with analysts playing a monitoring role resulting in more accurate ETR estimates. Second, I include an indicator variable, *EM*, equal to one if the firm would have missed the annual analysts' consensus forecast (within five cents) without a change in ETR. This variable controls for the incentive to beat analysts' forecast using tax expense (Dhaliwal et al. 2004).[18] *IO* is percent institutional ownership. H2 does not predict the sign of the *IO* coefficient estimate; however, a negative coefficient would be consistent with institutional owners playing a monitoring role resulting in more accurate ETR estimates.

AUDITOR is a vector of auditor characteristics that have been shown to improve audit quality. I include an indicator for Big 4 auditors (*BIG4*), tax fees paid to the auditor (*APTS*)[19], auditor expertise (*EXPERT*)[20], auditor tenure (*TENURE*), and audit office size (*OFFICE_SIZE*). A positive coefficient estimate on these variables would be consistent with the notion that improved audit quality extends to the interim review process, resulting in more accurate ETR reporting.

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[18] Prior research generally finds that firms decrease ETR to meet analysts' forecasts but not other earnings targets (see Graham et al. 2012 for a review); in untabulated analysis I also do not find that firms decrease ETR to meet prior year earnings, so I only include the incentive to beat analysts' forecast as a control in my main analysis.

[19] My primary analysis examines auditor-provided tax fees; however I also examine other non-audit services. Untabulated results indicate no relation between other non-audit services and interim tax reporting accuracy.

[20] In my primary analysis I define *EXPERT* following McGuire et al. (2012) as a measure of combined audit and tax expertise. See Appendix C for details. In untabulated analyses, I replace *EXPERT* with *TAX_EXPERT* or *AUDIT_EXPERT* following McGuire et al. (2012) and find no significant relation between tax-specific or audit-only expertise and ETR accuracy.

FIRM_FACTORS is a vector of firm-specific characteristics that are likely associated with the complexity of the tax accounts based on evidence in prior research. I include firm size (*SIZE*) because research suggests larger firms have more opportunity for tax planning (e.g., Omer et al. 1993; Rego 2003; De Simone et al. 2014). Larger firms may have more complex tax situations resulting in less accurate ETR estimates, but also may have more effective tax departments that could produce more accurate ETR estimates. Therefore, I do not predict the sign of the association between *SIZE* and *ACCURACY*. To examine various components of tax complexity, I include number of geographic and business segments (*GEO_SEGS* and *BUS_SEGS*, respectively), changes in geographic mix of income (Δ*MIX*)[21], merger and acquisition activity (*M&A*), research and development activity (*R&D*), discontinued operations and extraordinary items (*DISC_EXTRA*), deferred taxes (*DTA*), and equity compensation (*EQUITY_COMP*) because prior research suggests these factors are associated with tax rates and therefore could create complexity in the tax function and estimating interim ETRs (e.g., Klassen et al. 1993; Collins et al. 1998; Robinson et al. 2010; De Simone et al. 2014; Bratten et al. 2016; De Simone et al. 2015). I include sales growth (Δ*SALES*) and prior earnings volatility (*EARN_VOL)* to examine factors related to the difficulty of forecasting earnings (e.g., Baik et al. 2011; Goodman et al. 2014). I also include leverage (*LEV*), profitability (*ROA*), market-to-book ratio (*MTB*), and abnormal accruals (*ABACC*) to

[21] I use absolute value of changes in geographic mix of income because both increases and decreases in ratio of foreign to total income could affect the ability to successfully predict the ETR implications of such a change.

control for additional firm characteristics. I expect the tax complexity and earnings forecast difficulty variables to be negatively associated with interim tax reporting accuracy; however, it is an empirical question as to which factors are associated with both accuracy and bias. Finally, I include year and industry fixed effects to control for cross-sectional and time-series variation across industries and years and standard errors are clustered by firm (Petersen 2009; Gow et al. 2010). All variable definitions are included in Appendix C.

Self-Selection Correction

The decision for a company to purchase tax services from its auditor is not random (e.g., Lassila et al. 2010) and could introduce self-selection bias into my analysis (Li and Prabhala 2005). I therefore estimate a two-equation model to measure treatment effects (e.g., Greene 2000; Luez and Verrecchia 2000). Specifically, I follow McGuire et al. (2012) and estimate the following probit regression to model the firm's decision to purchase tax services from the external auditor:

$$\Pr(APTS = 1)_{it} = \beta_0 + \beta_1 LNAUDFEES_{it} + \beta_2 OPPORTUNITY_{it} + \beta_3 EQINC_{it} + \beta_4 PPE_{it} + \beta_5 CASH_{it} + \beta_6 DEP_{it} + \beta_7 SEC\_TIER_{it} + \beta_m EQUATION1_{it} + \varepsilon_{it} \quad (2)$$

EQUATION1 is the vector of variables from Equation (1), and all other variables are defined in Appendix C. I use the estimates from Equation (2) to construct an inverse

Mills ratio (*IMR*) and include this as a control variable in Equation (1). The inverse Mills ratio accounts for self-selection and yields consistent parameter estimates using OLS.[22]

Information Content of Tax Accounts

I also test the association between prior tax reporting accuracy and the information content of the tax accounts. My primary empirical test examines the slope coefficient relating long-window returns to changes in estimated taxable income and its interaction with prior interim tax reporting accuracy. This test follows prior research (e.g., Francis et al. 2005; Hanlon et al. 2008) that interprets the slope coefficient as a measure of the informativeness of earnings. Specifically, I examine the informativeness of pretax earnings changes, estimated taxable income changes, and the effect of tax reporting accuracy by estimating the following regression:

$$RETURN_{it} = \beta_0 + \beta_1 \Delta PTBI_{it} + \beta_2 \Delta TI_{it} + \beta_3 3YR\_ACCURACY_{it} + \beta_4 \Delta TI x 3YR\_ACCURACY_{it} + \varepsilon_{it} \quad (3)$$

Following Hanlon et al. (2005), *RETURN* is the 16 month market-adjusted return for firm *i* starting at beginning of fiscal year *t* and ending four months after the end of fiscal year *t*. $\Delta PTBI$ and ΔTI are year to year changes in pretax and estimated taxable income, respectively. Importantly, taxable income is estimated using amounts in the financial statements, which is available to investors. *3YR_ACCURACY* is the quartile

[22] Lennox et al. (2012) provide guidance on implementing self-selection correction procedures. Consistent with their guidance, Equation (2) contains exclusionary variables (i.e., independent variables in the first-stage model not included in the second-stage model). The variables in the first-stage model not included in the second stage model are *LNAUDFEES, OPPORTUNITY, EQINC, PPE, CASH, DEP,* and *SEC_TIER*. Lennox et al. (2012) also argue that the inverse Mills ratio may induce results in the second-stage model. In untabulated analyses, I exclude the inverse Mills ratio from Equation (1); my inferences are unchanged.

rank of interim tax reporting accuracy over the prior three years, where higher values indicate greater accuracy. Because tax differences vary across industries (Mills and Newberry 2001), I rank *3YR_ACCURACY* by industry (two-digit SIC code) and I scale the ranks to range between -0.5 and 0.5. Appendix C provides specific calculations for all variables.

Consistent with prior research (Hanlon et al. 2005; Ayers et al. 2009), I expect β_1 and β_2 to be positive, indicating that both pretax and taxable income provide information to the market. Based on H4, I predict that β_4 will be positive, indicating a stronger relation between returns and changes in estimated taxable income when the firm has reported its tax estimates more accurately in the past. Note that by examining the interaction between accuracy and changes in taxable income, while including the main effect for changes in taxable income, this analysis allows me to test how the association between estimated taxable income and returns varies by prior tax reporting accuracy. Therefore, this test is designed to examine whether the information content of taxable income estimated from the financial statements is improved when there is less estimation error, as proxied by prior tax reporting accuracy.

As an additional test of how the information content of estimated taxable income varies with prior tax reporting accuracy, I examine the *relative* information content of changes in estimated taxable income to book income for high and low accuracy firms. By examining the relative information content, I am able to directly test the information content of tax expense (i.e., the numerator of the ETR) relative to pre-tax book income (i.e., the denominator of the ETR). My test follows prior research (Hanlon et al. 2005;

Ayers et al. 2009) and measures the information content of estimated taxable and book income as the adjusted R^2 of regressions of returns on each measure of income individually. Specifically, I estimate the following equations annually for high and low accuracy firms:

$$RETURN_{it} = \beta_0 + \beta_1 \Delta TI_{it} + \varepsilon_{it} \quad (4)$$

$$RETURN_{it} = \beta_0 + \beta_1 \Delta PTBI_{it} + \varepsilon_{it} \quad (5)$$

I then test the average yearly ratio of the adjusted R^2 from Equation (4) and (5) for each group of firms. As noted in Ayers et al. (2009), the advantage of this research design is that it allows me to compare the relative information content of the two income measures while holding returns for the firm constant; it does not compare adjusted R^2 of estimated taxable income across samples, which would be susceptible to possible alternative explanations. That is, differences in the relative information content of taxable income and pre-tax income help to rule out the explanation that prior ETR accuracy is correlated with a firm characteristic that would affect the association between both income measures and returns. H4 predicts that the ratio of adjusted R^2 from Equation (4) to adjusted R^2 from Equation (5) will be greater for high tax reporting accuracy firms because the information contained in the tax accounts will be perceived as higher quality and therefore more reliable.

IV. RESULTS

Sample Discussion

My primary sample includes all firm-year observations at the intersection of Audit Analytics, Compustat, IBES, and Thomson Reuters Institutional Holdings databases from 2002 to 2013 for which all variables are available. I require audit and tax fee data from Audit Analytics, financial statement data from Compustat, institutional ownership data from Thomson Reuters, and analyst forecast data from IBES. I begin my sample period in 2002 because of the limited availability of auditor-provided tax service fee data prior to 2002 as well as changes in auditing and reporting requirements following SOX. Consistent with prior tax research, I exclude financial institutions and utilities (SIC codes 6000-6999 or 4900-4999), firm-years with negative pre-tax income, ETRs greater than 1 or less than zero in any quarter, total assets less than $10 million, and I winsorize continuous variables at the 1st and 99th percentiles to reduce the influence of outliers. These requirements result in a sample of 13,509 firm-year observations. Table 1 summarizes my sample selection procedure.

Descriptive and Univariate Results

Figure 1 presents histograms of changes in ETR from the first, second, and third quarter to fourth quarter in Panel A, B, and C, respectively. Overall, Figure 1 suggests substantial variation in ETR changes and a significant number of these changes are large. In fact, 9.8 (16.0) percent of observations have ETR increases (decreases) of more

than 5.0 percent from first to fourth quarter.[23] I note that some bias appears to exist in my sample (i.e., the distribution is centered left of zero); however, a large portion of observations have *positive* ETR changes (39.1, 39.2, and 43.2 percent are positive from first, second, and third quarters, respectively).

Table 2 presents descriptive statistics for the variables needed in my analysis. The mean of *ACCURACY1*, *ACCURACY2,* and *ACCURACY3* indicate that the absolute value of firms' ETR changes from first, second, and third quarter to year-end ETR are 4.8, 3.8, and 2.8 percent on average. This pattern is consistent with the expectation that firms provide more accurate ETR estimates later in the year. Table 2 also provides evidence that ETR changes in my sample exhibit some bias, shown by negative mean and median values of $\Delta Q1Q2$, $\Delta Q2Q4$, and $\Delta Q3Q4$.

Regarding auditor characteristics, approximately 87 percent of firms in my sample are audited by Big 4 auditors, an average of 11 percent of total fees paid to the auditor are tax fees, and average tenure is approximately 7.7 years. Approximately 42 percent of firm years in my sample are audited by experts, approximately the same proportion as in McGuire et al. (2012). My observations have an average of six analysts following the firm and have 64 percent institutional ownership. Approximately ten percent of my observations would have missed analysts' forecasts without a change in ETR from third to fourth quarter within five cents (i.e., $EM = 1$); therefore, my sample is much broader than studies that specifically examine earnings management through tax

[23] Observations with increases (decreases) of more than 5.0 percent from second to fourth and third to fourth quarter are 7.4 (12.7) percent and 5.8 (8.3) respectively.

expense (e.g., Dhaliwal et al. 2004) because it is not restricted to firm-years within five cents of analysts' consensus forecast.

Next, I discuss univariate correlations between my variables (untabulated). Not surprisingly, *ACCURACY1*, *ACCURACY2*, and *ACCURACY3* are positively correlated. All three accuracy variables are negatively correlated with a number of tax complexity and forecast difficulty variables. Regarding H1, accuracy is positively correlated with *AF*, suggesting analysts may play a monitoring role that results in more accurate interim ETR estimates. Regarding H2, accuracy is positively correlated with *IO*, suggesting institutional owners are also able to serve a monitoring role over interim ETR reporting. Regarding H3, accuracy is positively correlated with *BIG4*, *APTS*, and *TENURE*, suggesting Big 4 auditors, auditor-provided tax services, and auditor tenure may be associated with improved interim review process resulting in more accurate ETR estimates.[24]

Multivariate Results

Table 3 Panel A reports the results of estimating the first-stage model, Equation (2), to address the potential endogeneity of firms selecting to purchase tax services from their auditor. The area under the ROC curve is 0.81, suggesting good discriminatory power (Hosmer and Lemeshow 2002). The results of my selection model are generally consistent with those reported by both Lassila et al. (2010) and McGuire et al. (2012).

[24] I note that a number of the variables in my analysis are highly correlated (e.g., the correlation between *SIZE* and *AF* is 0.66). Untabulated analysis suggests that multicollinearity is not a major concern in my regressions. The largest variance inflation factor in my analysis is 2.82 on *SIZE* and prior work suggests a variance inflation factor of 10 as being large enough to indicate a problem (Chatterjee and Price 1991).

Table 3 Panel B presents the results of the interim tax reporting accuracy model, which simultaneously estimates the treatment and outcome model (Equations 2 and 1). Columns 1, 2, and 3 present the results when the dependent variable is *ACCURACY1*, *ACCURACY2*, and *ACCURACY3*, respectively. In column two I find that RHO, which represents the correlation between error terms in Equations (1) and (2), is statistically significant, suggesting the use of a treatment effects model is important to control for endogeneity. However, I find that *APTS* is not significantly associated with interim tax reporting accuracy. Therefore, I find no evidence that auditor-provided tax services are associated with interim tax reporting accuracy in this analysis, although it is important to control for this potential endogeneity issue *ex ante*.[25]

Regarding H1, I find that analyst following (*AF*) is positively associated with interim tax reporting accuracy in the second and third quarters (p-values < 0.05). These results reject H1 and are consistent with analysts serving a monitoring role that improves the accuracy of second and third quarter ETR estimates. Regarding H2, I find that institutional ownership (*IO*) is positively associated with interim tax reporting accuracy in all three quarters (p-values <0.01). These results reject H2 and provide evidence that institutional investors serve a monitoring role resulting in more accurate ETR estimates. Although analyst following and institutional ownership likely overlap (i.e., they are positively correlated), both coefficients are significant in my analysis indicating each

[25] My inferences are unchanged when estimating Equation (2) without the treatment effects model.

serves an incremental monitoring role.[26] Interestingly, firms with the incentive to manage earnings through tax accounts to meet or beat analysts' expectations (*EM* =1) have *more* accurate ETR estimates, on average. A plausible explanation for this result is that to be in this set of firms (i.e., within five cents of analysts' forecast), analysts' forecast must be relatively accurate and this is more likely when the firm reports more accurate information.

Regarding H3, I find evidence that auditor tenure is positively associated with interim tax reporting accuracy, consistent with improved auditor-client communication and higher quality reviews when the auditor has been serving the client for a longer period. However, I do not find strong evidence that Big 4 auditors, auditor-provided tax services, audit office size, or expertise is consistently associated with interim tax reporting accuracy.[27] Although prior research generally suggests these characteristics are associated with improved audit quality, I do not find strong evidence that these characteristics improve the interim review process of the tax accounts.[28]

Regarding the firm characteristics associated with interim tax reporting accuracy, I find that firm size (*SIZE*) and profitability (*ROA*) are both positively associated with

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[26] I further explore the monitoring roles of analyst following and institutional ownership by examining their association with ETR estimation bias (Table 3 Panel C) as well as positive and negative ETR surprises (Table 4).

[27] Several auditor variables are highly correlated, so I also estimate my regressions while including each individually; my inferences remain unchanged, suggesting multicollinearity of the auditor variables is not driving the insignificant results.

[28] In untabulated analyses, I create a composite "auditor score" as the sum of *BIG4*, *EXPERT*, and indicator variables equal to one if the firm is above the median for each continuous variable. This composite score is positively associated with tax reporting accuracy, but the result appears driven by tenure; the composite score becomes insignificantly associated with accuracy if I remove tenure from the composite score.

accuracy. As expected, I find that geographic complexity (*GEO_SEGS*), changes in geographic mix of income (Δ*MIX*), R&D activity (*R&D*), discontinued operations and extraordinary items (*DISC_EXTRA*), deferred tax assets (*DTA*), and equity compensation (*EQUITY_COMP)* are negatively associated with interim tax reporting accuracy. The coefficient estimate on earnings volatility (*EARN_VOL*) is negative and significant in the first and second columns but not the third column. The reduction in significance later in the year is consistent with volatile earnings being an important determinant of ETR accuracy early in the year, but less important as uncertainty regarding annual earnings is resolved.

In sum, Table 3 Panel B provides insight into firm characteristics, auditor characteristics, and market participants that are associated with interim tax reporting accuracy. I provide evidence that analyst following and institutional ownership are associated with improved interim tax reporting accuracy, rejecting H1 and H2. Regarding H3, I find that auditor tenure is associated with improved interim tax reporting accuracy, but do not find such an association with other auditor characteristics.

Interim Tax Reporting Bias

Because prior research suggests a level of bias in interim tax reporting estimates (e.g., Comprix et al. 2012), and that bias may contribute to ETR accuracy, I also examine what factors are systematically associated with signed ETR changes. I re-estimate Equations (1) and (2) after replacing the dependent variable in Equation (2) with signed changes in ETRs from the first, second, and third to the fourth quarter

*(*Δ*Q1Q4*, Δ*Q2Q4*, and Δ*Q3Q4*), where positive amounts represent an increase in ETR from quarter *q* to year-end ETR. These results are presented in Table 3 Panel C.[29]

Regarding the influence of market participants, I find that firms with the incentive to meet or beat analysts' forecasts (*EM* = 1) decrease their ETRs on average (p-values < 0.05 in quarters 2 and 3), consistent with prior research (e.g., Dhaliwal et al. 2004).[30] However, I find that analyst following is positively associated with ETR changes (p-values < 0.01 in quarters 2 and 3). This result is consistent with analysts serving a monitoring role by either curbing tax planning later in the year that is "aggressive" or by reducing "slack" in interim ETRs that creates bias (e.g., Comprix et al. 2012). In contrast, I find that institutional ownership is negatively associated with ETR changes. This result is consistent with institutional owners applying pressure on firms regarding ETR changes, either by demanding additional tax planning that reduces ETRs or by penalizing surprise ETR increases, resulting in biased ETR estimates to avoid ETR increases.[31] Both the analyst following and institutional ownership results have two explanations discussed above; therefore, in my next analysis, I add more

[29] In this test, RHO is not significant in any column; I re-estimate Equation (2) under this specification without the treatment effects model and my inferences are unchanged.
[30] In an untabulated test, I create a variable that is the mirror-image of EM (i.e., an indicator equal to one if they firm would have beat the analyst forecast using prior quarter ETR by less than five cents, and zero otherwise) to control for the possibility that firms increase tax expense when they would have otherwise beat analysts' forecasts in order to smooth income or create a "cookie jar reserve." I do not find this variable is significantly associated with ETR changes, suggesting this behavior does not occur in my sample on average.
[31] I acknowledge that even if institutional owners do not actually "penalize surprise ETR increases," firms may still attempt to avoid surprise ETR increases to avoid a *potential* negative reaction.

conclusive evidence by examining the association of analyst following and institutional ownership with positive and negative ETR changes.

Regarding firm characteristics, I find little evidence of systematic bias associated with changes in geographic mix of income, R&D activity, deferred tax assets, or equity compensation even though these factors are strongly associated with accuracy. These results suggest that the large estimation error related to these factors is approximately evenly distributed between ETR increases and decreases; that is, I find strong evidence of *estimation error* but no evidence of *bias* related to these factors.[32]

Positive and Negative ETR Surprises

To provide additional insight into interim tax reporting accuracy and bias, I examine positive and negative ETR "surprises." It is possible that the results observed in Table 3 are caused by certain factors being associated with an increased propensity to decrease (increase) ETRs throughout the year, or a decreased propensity to increase (decrease) ETRs. For example, in Table 3 Panel C I find institutional ownership is negatively associated with ETR increases; this observed relation could be because firms with high institutional ownership tend to tax plan and have *greater decreases* in ETR throughout the year on average. However, it could also be because firms with high institutional ownership tend to *avoid increases* in ETR. Both of these explanations are plausible, so I examine this question further.

[32] In additional analyses I examine these factors using a "de-biased" accuracy measure. See Section V for details.

I estimate a multinomial logit regression with *POS_SURPRISE* and *NEG_SURPRISE* as my dependent variables. *POS_SURPRISE* (*NEG_SURPRISE)* is an indicator variable equal to one if the firm-year has an increase (decrease) in ETR from third to fourth quarter of greater than five percent, and zero otherwise.[33] This test allows me to examine which factors are associated with substantial changes in ETRs and also allows the changes to be directional, addressing the issue discussed above. I include all independent variables from Equation (1) in this analysis. Table 4 presents the results.

I find that analyst following is negatively associated with negative ETR surprises, but not associated with positive ETR surprises. This result is consistent with the result in Table 3 Panel C (i.e., analyst following is associated with positive ETR changes); however, this result provides an additional insight: the relation is caused by a reduced likelihood of negative ETR changes rather than firms actually increasing ETR at year end (i.e., *AF* is not associated with *POS_SURPRISE).* A lower likelihood of negative ETR surprises is consistent with a monitoring role of analysts because this could be caused by reductions in aggressive tax planning at year end or less bias in interim periods that causes an ETR decrease at the end of the year. Taken together, my results suggest that analysts play a monitoring role over the tax accounts that results in more accurate ETR estimates during interim periods and a lower likelihood of negative ETR surprises at year end.

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[33] My inferences are unchanged using first to fourth or second to fourth quarter, but I focus on ETR surprises from third to fourth quarter because research in this area has focused on "last chance" manipulations of ETR from the third to fourth quarter, and large increases in third to fourth quarter should be the greatest "surprise" because more information is available at third quarter than first or second quarter.

I find that institutional ownership is negatively associated with positive ETR surprises but not associated with negative ETR surprises from the third to fourth quarter. This result is consistent with Table 3 Panel C (i.e., institutional ownership is negatively associated with ETR changes); however, the relation is caused by a lower likelihood of positive surprises rather than greater decreases in ETR at year end (i.e., *IO* is not associated with *NEG_SURPRISE*). A lower likelihood of positive ETR surprises is consistent with firms avoiding surprises that could have a negative impact on earnings per share which would be viewed negatively by investors. However, because I find no evidence that institutional ownership is associated with negative ETR surprises, I conclude that the negative association between institutional ownership and ETR changes observed in Table 3 Panel C is caused by a lower likelihood of ETR increases, rather than additional tax planning at year end. Taken together, my results suggest that institutional owners play a monitoring role over the tax accounts that results in more accurate interim ETR estimates and part of this monitoring role is encouraging fewer positive ETR surprises at year end.

Information Content Results

Next, I examine the consequences of interim tax reporting accuracy by testing the association between stock returns and estimated taxable income. For this analysis, I follow the sample selection procedures in Ayers et al. (2009). I collect observations for which all data needed for my analysis are available at the intersection of Compustat and CRSP from 1993 through 2013. I exclude financial institutions and utilities (SIC codes 6000-6999 or 4900-4999), firm-years with fiscal year changes, and firm-years with the

absolute value of the change in pre-tax book income ($\Delta PTBI$) or estimated taxable income (ΔTI) greater than one. I also require positive tax expense (*GAAP_ETR5*) and pre-tax book income over the past 5 years. These criteria result in a sample of 31,324 firm-year observations.

Table 5 presents descriptive statistics for my information content sample. I separately present descriptive statistics for *RETURN,* $\Delta PTBI$, ΔTI, and *GAAP_ETR5* for the overall sample, those in the top quartile of accuracy based on *3YR_ACCURACY* ("high accuracy firms"), and all other firms. The descriptive statistics for the overall sample are similar to those in Ayers et al. (2009). I find that high accuracy firms do not have significantly different returns, changes in pre-tax income, or changes in estimated taxable income from all other firms. Interestingly, high accuracy firms have a significantly *lower* mean five-year GAAP ETRs than all other firms, although I note the opposite is true for the 25th and 50th percentiles.[34]

Table 6 presents the results of estimating Equation (3) for the full sample (columns 1 and 2), the pre-SOX sample (columns 3 and 4) and the post-SOX sample (columns 5 and 6). In the odd numbered columns, I regress returns on changes in pre-tax book income and changes in taxable income. The positive and significant coefficients on both variables (p-values < 0.01 in all columns) are consistent with prior research (Hanlon et al. 2005; Ayers et al. 2009) and suggest that estimated taxable income provides information to the market that is incremental to changes in pre-tax income. In

[34] I perform an analysis using a high versus low accuracy sample matched on level of ETR in order to rule out the explanation that low ETRs are also more difficult to report accurately.

the even numbered columns, I find that the coefficient on the interaction term $\Delta TIx3YR\_ACCURACY$ is positive and significant, providing evidence that the information contained in estimated taxable income is increasing in prior ETR accuracy, even after controlling for the magnitude of the change in taxable income itself (ΔTI). I interpret these results as evidence that potential error in taxable income significantly affects the association between stock returns and estimated taxable income, consistent with H4.

Table 7 reports the results of my second test of how the relative information content of estimated taxable income versus pre-tax income varies by prior ETR accuracy. In Panel A, I split the firms based on the median of *3YR_ACCURACY* and compare the ratio of adjusted R^2 values of yearly estimates of Equations (4) to adjusted R^2 values of yearly estimates of Equation (5) for each subsample. Because I estimate Equations (4) and (5) separately using the same firm-year observations, a higher ratio of R^2_{TI} / R^2_{PTBI} indicates a stronger relation between returns and changes in taxable income relative to the relation between returns and changes in pretax income for the same firm. Intuitively, this means that there is relatively more information content in taxable income when this ratio is high. I therefore examine the relative information content of taxable income by testing the difference in average yearly ratio of R^2_{TI} / R^2_{PTBI} for each group of firms.

In Panel A, the average ratio for all years is 0.601 for high accuracy firms, compared to 0.384 for low accuracy firms, and the difference is statistically significant (p-value < 0.01 using both t-test and Wilcoxon rank sum test). This result suggests the

information content of estimated taxable income has relatively more information content when the firm has been more accurate with tax estimates in the past, consistent with H4. These results suggest that the relative information content of taxable income for low accuracy firms is only 64 percent (0.384 / 0.601 = 64 percent) of the information content of high accuracy firms.

I examine the extreme ends of the distribution of 3 year accuracy in Panels B and C. Specifically, in Panel B I split the sample into the top quartile based on *3YR_ACCURACY* and all other firms. For the full sample period, I find that the ratio of R^2_{TI} / R^2_{PTBI} is significantly higher for high accuracy firms compared to all other firms (p-value < 0.01 using both t-test and Wilcoxon rank sum test). In Panel C, I split the sample into the lowest quartile based on *3YR_ACCURACY* and all other firms. For the full sample period, I find that the ratio of R^2_{TI} / R^2_{PTBI} is significantly lower for low accuracy firms compared to all other firms (p-value < 0.01 using both t-test and Wilcoxon rank sum test).The results of both these analysis are consistent with H4 and provide evidence that accuracy is associated with the level of information content of taxable income at both ends of the distribution of tax accuracy.

Notably, Ayers et al. (2009) provide evidence that the information content of taxable income is lower for high tax planning firms (i.e., firms with low *GAAP_ETR5*).[35] To the extent that high tax planning firms are also inaccurate, my results could be driven by tax planning rather than prior reporting accuracy. To mitigate this concern, I split

[35] In untabulated results I replicate this finding using my sample.

firms into high and low accuracy based on *3YR_ACCURACY* and perform my analysis on a sample of firms matched on level of tax planning. Specifically, I match each high accuracy firm with a low accuracy firm based on year, 2-digit SIC code, and *GAAP_ETR5*.[36] This matching procedure results in 13,276 firm-year observations for each sample, or 26,552 total. Untabulated analysis shows no significant difference in level of tax planning (i.e., *GAAP_ETR5*) between the matched samples (p-value = 0.93).

Results from this analysis are presented in Table 7 Panel D. Even after matching firms based on tax planning, I find that high accuracy firms have relatively more information content in estimated taxable income than low accuracy firms. The average R^2_{TI} / R^2_{PTBI} for all years in the matched sample is 0.814 for high accuracy firms and 0.469 for low accuracy firms, suggesting the information content for low accuracy firms is only 58 percent of the information content of high accuracy firms on average, even after controlling for level of tax planning. In sum, the results in Tables 6 and 7 provide strong evidence consistent with H4 and suggest that prior tax reporting accuracy provides a signal to the market about the informativeness of reported tax expense.

Market Response to Beating Analysts' Targets Using Tax Expense

To further investigate the effect of tax reporting accuracy on investor response to reported tax expense, I examine short-window returns surrounding earnings announcements for firms that beat analysts' forecasts by decreasing their tax rate from third to fourth quarter. Gleason and Mills (2008) show that when firms use tax expense

[36] The matching procedure required that *GAAP_ETR5* of the low accuracy firm must be between 90% and 110% of *GAAP_ETR* of the high accuracy firm.

to beat analysts' forecasts, the market discounts the reward by approximately 86% on average. I extend this analysis by testing whether this discount varies based on prior tax reporting accuracy. To the extent that inaccurate estimates provide a signal regarding the potential error in reported tax expense, I expect that the market discount will be greater for firms that have been inaccurate in prior years. This expectation is consistent with noise reducing the price reaction to accounting information (Holthausen and Verrecchia 1988; Kothari 2001; Hanlon et al. 2008).

First, I replicate the results in Gleason and Mills (2008), presented in column 1 of Table 8. Specifically, I regress cumulative size-adjusted abnormal returns (*CAR*) for the five day window around the earnings announcement on *Beat_w_Tax*, an indicator variable equal to one if the firm used a tax rate decrease to beat analysts' forecast and zero otherwise, and control variables following Gleason and Mills (2008). The coefficient estimate on *Beat_w_Tax* in column 1 is negative (p-value < 0.01), which is consistent with Gleason and Mills (2008) and indicates that the market discounts the reward for beating analysts' forecasts by using tax expense.

Next, I split firms that beat analysts' forecast into two groups based on prior tax reporting accuracy (*3YR_ACCURACY)*. *Beat_w_Tax_Accurate* is an indicator variable equal to one for firms that beat analysts' target and are above the median of *3YR_ACCURACY*, zero otherwise. *Beat_w_Tax_Inaccurate* is an indicator variable equal to one for firms that beat analysts' target and are below the median of *3YR_ACCURACY*, zero otherwise. The results in column 2 of Table 8 indicate a significant market discount for firms that beat the analysts' forecasts and have been

inaccurate in the past; however, I do not find a similar market discount for firms that have a record of accurate tax reporting. These results suggest that investor response to beating earnings targets using tax expense varies with prior tax reporting accuracy, a potential signal for the reliability of reported tax expense.

V. SUPPLEMENTAL ANALYSES

Extracting Bias from Accuracy

In addition to my main tests that examine both accuracy and bias, I take another approach to separate the estimation error and bias. I "de-bias" the accuracy measure (*ACCURACY)* by removing the estimated amount of bias in the estimated ETR reported at interim periods and use the adjusted accuracy measure as a dependent variable when estimating Equation (1). Prior research uses a similar approach to extract predictable errors from analysts' forecasts (e.g., Ali et al. 1992; Larocque 2013).

First, I regress the signed difference between year-end ETR and the year-to-date ETR from the first, second, and third quarter ($\Delta Q1Q4$, $\Delta Q2Q4$, and $\Delta Q3Q4$, respectively) on all variables included in Equation (1). Second, I estimate the predicted bias for each observation based on the coefficient estimates from these regressions. I remove the predicted bias (i.e., signed change in ETR) from each observation by subtracting the predicted bias from the actual change in ETR from first, second, and third quarter to year-end ETR to calculate de-biased changes in ETR. I then take the absolute value of the de-biased changes in ETR and multiply by negative one to generate ETR accuracy measures (*ACC1_unbiased, ACC2_unbiased*, and *ACC3_unbiased)* with the predicted ETR bias removed. These accuracy measures represent the (in)accuracy of the ETR estimates that are not attributable to bias, and therefore are attributable to estimation error.

I re-estimate Equation (1) after replacing the de-biased accuracy measures as the dependent variable and present the results in Table 9. Consistent with my main analysis,

I find that analyst following, institutional ownership, and auditor tenure are associated with more accurate ETR reporting, while a number of factors that contribute to firm complexity (e.g., geographic segments, changes in mix of foreign and domestic income, R&D expenses, earnings volatility, discontinued and extraordinary items, deferred tax assets, and equity compensation) are associated with less accurate ETR reporting using the de-biased accuracy measure. Thus, my main conclusions regarding the effect of these factors on accuracy through estimation error, rather than bias, are unchanged.

Discrete Period Items

Accounting standards require that firms recognize certain "discrete" items in the quarter they occur, potentially distorting the ability for the quarterly ETR to predict annual ETR. Consistent with this possibility, Bratten et al. (2016) find that discrete period items reduce the ability for management's reported ETR and analysts implied ETR to predict next-quarter ETR. To address the concern that my main results are driven by discrete period items, I follow Bratten et al. (2016) and conservatively label quarters as "clean" (i.e., likely free of discrete items) if the reported GAAP ETR is within 0.5% (on either side) from the IBES actual ETR and re-run my accuracy analysis using this clean subsample. This procedure assumes management's ETR estimate is free of discrete items when it matches the IBES actual ETR because the IBES actual ETR is adjusted for items that require discrete accounting treatment. Thus, if the quarter had a significant discrete period item the IBES actual ETR would not match management's ETR estimate due to this adjustment. In untabulated results, I find the coefficient estimate for *IO, AF,*

and *TENURE* remain positive and significant using the "clean" subsample.[37] Thus, my conclusions regarding hypotheses 1, 2, and 3 remain unchanged after removing the potential effect of discrete period items.

[37]However, I note that for this analysis the coefficient estimate on analyst following is significant for first and third quarter estimates but not second quarter estimates as in my main analysis.

VI. SUMMARY AND CONCLUSION

While a significant number of prior studies have focused on the variation in effective tax rates among firms (e.g., Dyreng et al. 2008), my study examines the causes and consequences of *within firm-year* GAAP effective tax rate reporting accuracy. I use the financial reporting requirements under APB 28, *Interim Financial Reporting*, to examine the determinants of ETR estimation accuracy as well as the importance of tax reporting accuracy on investor reaction to information contained in tax reporting.

I find that analyst following, institutional ownership, and auditor tenure are positively associated with interim tax reporting accuracy. These results are consistent with a monitoring role over financial reporting of the tax accounts which results in more accurate ETR estimates. My results also suggest that analysts and institutional investors play different monitoring roles: analysts appear to reduce bias in ETR estimates that result in earnings *increasing* ETR surprises at year end, while institutional owners appear to reduce earnings *decreasing* ETR surprises at year end. I also find that firm size, profitability, and auditor tenure are positively associated with interim tax reporting accuracy, and that geographic complexity, change in geographic mix of income, discontinued and extraordinary items, deferred tax assets, and R&D activity are negatively associated with interim tax reporting accuracy. However, I do not find that these factors are associated with tax reporting *bias*, suggesting their association with less accurate reporting is due to *estimation error*.

I also examine whether the market reaction to information contained in the tax accounts varies by prior tax reporting accuracy. I find a stronger association between

stock returns and changes in estimated taxable income when interim tax reporting has been more accurate in the past, suggesting interim tax reporting accuracy provides a signal to the market about the usefulness of tax amounts reported in the financial statements. I also find that investors respond more positively to beating analysts' forecasts using a decrease in tax rate when the firm has a record of accurate tax reporting.

The requirement under APB 28 for companies to estimate annual ETR at each interim period is no easy task. The uncertainty, complex estimation, and substantial judgement create potential for significant estimation error in reported tax expense, a material expense for a broad set of firms. My study documents factors that are associated with interim tax reporting accuracy and demonstrates that accuracy has significant implications regarding investors' use of tax expense, providing a contribution to the literature regarding the pricing of tax information reported in financial statements.

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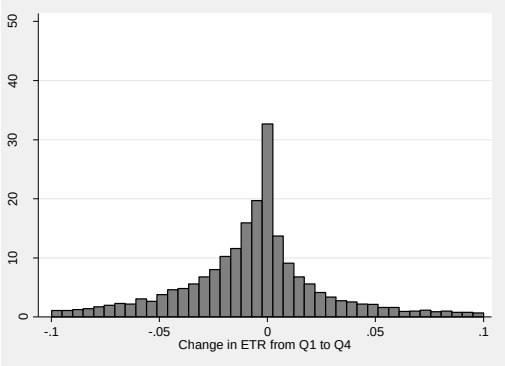
APPENDIX A

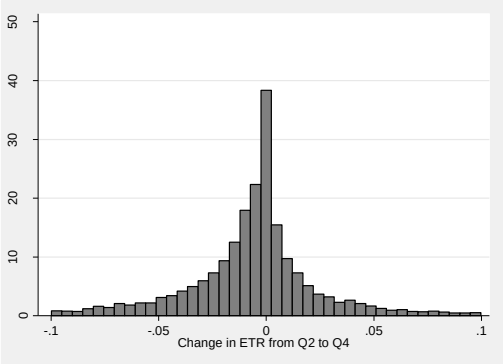
FIGURE AND TABLES

FIGURE 1

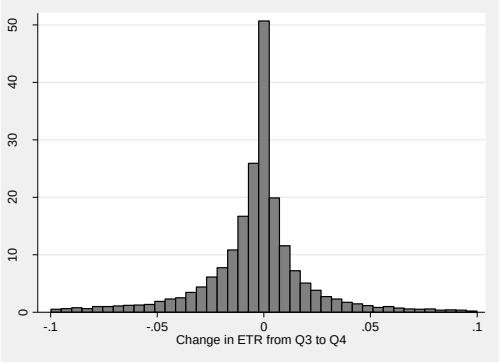
Panel A: ETR Changes from Quarter 1 to Quarter 4



Panel B: ETR Changes from Quarter 2 to Quarter 4



Panel C: ETR Changes from Quarter 3 to Quarter 4



Notes: This figure presents histograms for changes in ETR from 1st to 4th quarter, 2nd to 4th quarter, and 3rd to 4th quarter in Panel A, B, and C, respectively, for the full sample (n=13,509).

TABLE 1
Sample Selection

Sample Criteria	Firm-years
Firm-year observations from 2002 to 2013 available at the intersection of Compustat, Audit Analytics, IBES, and Thomson Reuters Institutional Holdings databases	54,100
Less: Financial institutions (SIC codes 6000-6999) and utilities (SIC codes 4900-4999)	(12,327)
Less: Observations with negative pretax income or ETR below zero or greater than one in any quarter	(18,296)
Less: Observations with assets less than 10 million	(149)
Less: Observations missing firm characteristic data	(8,789)
Less: Observations missing auditor characteristic data	(228)
Less: Observations missing analyst and institutional ownership data	(802)
Full Sample	13,509

Notes: Appendix C provides definitions for variables used in analyses.

TABLE 2
Descriptive Statistics: Determinants of Accuracy Sample

N = 13,509 Variable	Mean	Std Dev	25th Pctl	50th Pctl	75th Pctl
ACCURACY1	-0.048	0.081	-0.052	-0.020	-0.006
ACCURACY2	-0.038	0.070	-0.040	-0.015	-0.005
ACCURACY3	-0.028	0.059	-0.026	-0.009	-0.003
Δ*Q1Q4*	-0.011	0.093	-0.029	-0.005	0.008
Δ*Q2Q4*	-0.008	0.079	-0.022	-0.004	0.006
Δ*Q3Q4*	-0.004	0.066	-0.013	-0.001	0.006
SIZE	7.156	1.719	5.965	7.032	8.244
GEO_SEGS	0.961	0.725	0.000	1.099	1.609
BUS_SEGS	0.776	0.733	0.000	1.099	1.386
Δ*MIX*	0.125	0.246	0.000	0.012	0.114
M&A	0.159	0.366	0.000	0.000	0.000
R&D	0.035	0.058	0.000	0.005	0.049
Δ*SALES*	0.186	0.262	0.057	0.120	0.225
EARN_VOL	1.239	3.305	0.318	0.566	1.078
DISC_EXTRA	0.192	0.394	0.000	0.000	0.000
DTA	0.019	0.082	-0.022	0.007	0.048
EQUITY_COMP	0.017	0.020	0.003	0.007	0.022
LEV	0.151	0.162	0.000	0.115	0.246
ROA	0.081	0.058	0.041	0.068	0.107
MTB	3.067	3.145	1.551	2.331	3.628
ABACC	-0.002	0.448	-0.067	0.002	0.084
BIG4	0.868	0.338	1.000	1.000	1.000
APTS	0.109	0.126	0.002	0.065	0.173
EXPERT	0.424	0.494	0.000	0.000	1.000
TENURE	2.047	0.888	1.609	2.079	2.639
OFFICE_SIZE	3.370	1.323	2.398	3.367	4.248
AF	1.751	0.959	1.099	1.792	2.485
EM	0.103	0.305	0.000	0.000	0.000
IO	0.642	0.301	0.436	0.713	0.877
SEC_TIER	0.067	0.250	0.000	0.000	0.000
LNAUDFEES	13.969	1.221	13.205	13.921	14.708
OPPORTUNITY	0.299	0.348	0.025	0.116	0.529
EQINC	0.001	0.004	0.000	0.000	0.000
CASH	0.220	0.252	0.045	0.132	0.309
DEP	0.045	0.030	0.026	0.038	0.056
PPE	0.283	0.261	0.095	0.199	0.383

Notes: This table presents the descriptive statistics for the primary testing sample.
Appendix C provides variable definitions.
All continuous variables are winsorized at the 1% and 99% levels.

TABLE 3
Panel A: First-Stage Model (Likelihood of Auditor-Provided Tax Services)

DV = *APTS_INDICATOR*	Coefficient (Standard Error)
SIZE	0.074***
	(0.016)
GEO_SEGS	0.141***
	(0.023)
BUS_SEGS	0.018
	(0.021)
FOREIGN	0.090
	(0.062)
Δ*MIX*	0.106***
	(0.041)
M&A	-0.277
	(0.292)
R&D	-0.038
	(0.052)
Δ*SALES*	0.012***
	(0.004)
EARN_VOL	0.074***
	(0.016)
DISC_EXTRA	0.060
	(0.036)
DTA	0.327*
	(0.199)
EQUITY_COMP	-0.804
	(0.743)
LEV	0.040
	(0.095)
ROA	-0.008
	(0.274)
MTB	0.015***
	(0.005)
ABACC	-0.047
	(0.031)
BIG4	0.027
	(0.056)
EXPERT	1.073***
	(0.034)
TENURE	0.105***
	(0.016)
OFFICE SIZE	0.018
	(0.013)

(*Continued on next page*)

TABLE 3 Panel A, Continued

Variables	Coefficient (Standard Error)
AF	-0.010
	(0.021)
EM	-0.009
	(0.042)
IO	0.113**
	(0.053)
CASH	0.045
	(0.069)
DEP	0.418
	(0.571)
EQINC	-9.330***
	(3.378)
LNAUDFEES	0.144***
	(0.022)
OPPORTUNITY	-0.398***
	(0.053)
PPE	-0.151*
	(0.081)
SEC_TIER	-0.171***
	(0.064)
Constant	-0.010
	(0.021)
Industry Fixed Effects	YES
Year Fixed Effects	YES
N	13,509
Pseudo R-square	0.212
Area under the ROC Curve	0.811

Notes: This table present the results of estimating Equation (2), probability of purchasing auditor-provided tax services.
*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.
p-values are two-tailed and are calculated based on standard errors that are clustered by firm.
Appendix C provides variable definitions.

TABLE 3
Panel B: Determinants of Interim Tax Reporting Accuracy

Variables	(1) *ACCURACY1*	(2) *ACCURACY2*	(3) *ACCURACY3*
Market participants			
AF	0.002	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
EM	0.004**	0.004**	0.004***
	(0.002)	(0.002)	(0.002)
IO	0.010***	0.008***	0.008***
	(0.003)	(0.003)	(0.002)
Auditor Characteristics			
BIG4	-0.003	0.001	0.002
	(0.003)	(0.002)	(0.002)
APTS	0.009	0.008	0.007
	(0.007)	(0.006)	(0.005)
EXPERT	0.002	0.002	0.001
	(0.002)	(0.002)	(0.001)
TENURE	0.001	0.002***	0.003***
	(0.001)	(0.001)	(0.001)
OFFICE_SIZE	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.000)
Firm Characteristics			
SIZE	0.003***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)
GEO_SEGS	-0.005***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)
BUS_SEGS	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)
Δ*MIX*	-0.052***	-0.044***	-0.034***
	(0.004)	(0.004)	(0.003)
M&A	0.001	-0.000	-0.001
	(0.002)	(0.002)	(0.002)
R&D	-0.142***	-0.109***	-0.082***
	(0.020)	(0.016)	(0.014)
Δ*SALES*	-0.004	-0.003	-0.002
	(0.003)	(0.003)	(0.002)
EARN_VOL	-0.001**	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)
DISC_EXTRA	-0.007***	-0.004**	-0.003*
	(0.002)	(0.002)	(0.001)
DTA	-0.046***	-0.031***	-0.025***
	(0.011)	(0.009)	(0.009)

(*Continued on next page*)

TABLE 3 Panel B, Continued

Variables	(1) *ACCURACY1*	(2) *ACCURACY2*	(3) *ACCURACY3*
EQUITY_COMP	-0.036	-0.083**	-0.052*
	(0.042)	(0.037)	(0.031)
LEV	-0.008	-0.001	0.001
	(0.006)	(0.005)	(0.004)
ROA	0.288***	0.266***	0.244***
	(0.018)	(0.016)	(0.014)
MTB	-0.001**	-0.000*	-0.001***
	(0.000)	(0.000)	(0.000)
ABACC	-0.001	-0.000	-0.000
	(0.002)	(0.001)	(0.001)
IMR	-0.005	-0.008**	-0.005*
	(0.005)	(0.004)	(0.003)
Constant	-0.045***	-0.041***	-0.039***
	(0.006)	(0.005)	(0.005)
RHO	0.040	0.051*	0.035
	(0.034)	(0.027)	(0.025)
Wald χ^2 p-value	0.242	0.055	0.168
Year Fixed Effects	YES	YES	YES
Industry Fixed Effects	YES	YES	YES
Log-Psuedo Likelihood	9,771	11,765	13,929
N	13,509	13,509	13,509

Notes: This table presents the results of estimating Equation (1). In Columns 1 – 3, the dependent variable is interim tax reporting accuracy for the first, second, and third quarters, (*ACCURACY1, ACCURACY2,* and *ACCURACY3*, respectively).
*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p*-values are two-tailed and are calculated based on standard errors that are clustered by firm (Petersen 2009; Gow et al. 2010).
Appendix C provides variable definitions.

TABLE 3
Panel C: Determinants of Interim Tax Reporting Bias

Variables	(1) $\Delta Q1Q4$	(2) $\Delta Q2Q4$	(3) $\Delta Q3Q4$
Market participants			
AF	0.001	0.004***	0.003***
	(0.001)	(0.001)	(0.001)
EM	-0.001	-0.004**	-0.005***
	(0.003)	(0.002)	(0.002)
IO	-0.007*	-0.011***	-0.007***
	(0.004)	(0.003)	(0.003)
Auditor Characteristics			
BIG4	-0.002	0.001	-0.000
	(0.003)	(0.003)	(0.002)
APTS	-0.006	-0.015**	-0.009
	(0.008)	(0.006)	(0.005)
EXPERT	-0.002	-0.003	-0.003**
	(0.003)	(0.002)	(0.002)
TENURE	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
OFFICE_SIZE	-0.001*	0.000	-0.001
	(0.001)	(0.001)	(0.001)
Firm Characteristics			
SIZE	0.000	-0.001*	-0.001**
	(0.001)	(0.001)	(0.001)
GEO_SEGS	-0.003	-0.003**	-0.002
	(0.002)	(0.001)	(0.001)
BUS_SEGS	-0.001	-0.002	-0.000
	(0.001)	(0.001)	(0.001)
ΔMIX	-0.004	0.005	0.005
	(0.006)	(0.005)	(0.004)
M&A	0.002	0.000	-0.001
	(0.003)	(0.002)	(0.002)
R&D	-0.029	-0.018	-0.026*
	(0.024)	(0.019)	(0.016)
$\Delta SALES$	0.008**	0.005	0.004*
	(0.004)	(0.003)	(0.002)
EARN_VOL	-0.001*	-0.001**	-0.000*
	(0.000)	(0.000)	(0.000)
DISC_EXTRA	-0.006***	-0.003*	-0.002
	(0.002)	(0.002)	(0.002)
DTA	-0.010	-0.002	-0.014
	(0.012)	(0.010)	(0.009)

(*Continued on next page*)

TABLE 3 Panel C, Continued

Variables	(1) $\Delta Q1Q4$	(2) $\Delta Q2Q4$	(3) $\Delta Q3Q4$
EQUITY_COMP	0.052	0.034	0.015
	(0.047)	(0.041)	(0.032)
LEV	-0.003	0.002	0.001
	(0.007)	(0.005)	(0.005)
ROA	-0.094***	-0.067***	-0.061***
	(0.020)	(0.017)	(0.015)
MTB	0.001***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)
ABACC	-0.002	0.001	0.001
	(0.002)	(0.002)	(0.001)
IMR	0.001	0.006	0.008*
	(0.009)	(0.007)	(0.004)
Constant	0.008	0.007	0.012**
	(0.007)	(0.006)	(0.005)
RHO	0.022	-0.022	-0.052
	(0.054)	(0.053)	(0.034)
Wald χ^2 p-value	0.679	0.670	0.123
Year Fixed Effects	YES	YES	YES
Industry Fixed Effects	YES	YES	YES
Log-Psuedo Likelihood	7,058	9,279	11,793
N	13,509	13,509	13,509

Notes: This table presents the results of estimating Equation (1). In Columns 1 – 3, the dependent variable is the change in ETR from the first, second, and third quarters ($\Delta Q1Q4$, $\Delta Q2Q4$, $\Delta Q2Q4$, respectively).
*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p*-values are two-tailed and are calculated based on standard errors that are clustered by firm (Petersen 2009; Gow et al. 2010).
Appendix C provides variable definitions.

TABLE 4
Multinomial Logit: Positive and Negative ETR Surprises

Variables	(1) *POS_SURPRISE*	(2) *NEG_SURPRISE*
Market participants		
AF	0.018	-0.127**
	(0.065)	(0.054)
EM	-0.372***	-0.030
	(0.133)	(0.106)
IO	-0.532***	-0.141
	(0.163)	(0.143)
Auditor Characteristics		
BIG4	-0.213	-0.100
	(0.142)	(0.128)
APTS	-0.313	0.012
	(0.372)	(0.307)
EXPERT	0.037	0.016
	(0.090)	(0.076)
TENURE	-0.030	-0.053
	(0.055)	(0.044)
OFFICE_SIZE	0.060	0.071**
	(0.039)	(0.033)
Firm Characteristics		
SIZE	-0.113***	-0.047
	(0.039)	(0.033)
GEO_SEGS	0.259***	0.239***
	(0.075)	(0.061)
BUS_SEGS	-0.007	0.033
	(0.067)	(0.054)
Δ*MIX*	0.880***	0.907***
	(0.133)	(0.117)
M&A	0.038	-0.011
	(0.106)	(0.094)
R&D	2.381***	3.427***
	(0.841)	(0.647)
Δ*SALES*	0.223	-0.052
	(0.154)	(0.147)
EARN_VOL	-0.002	0.021***
	(0.012)	(0.007)
DISC_EXTRA	0.142	0.253***
	(0.100)	(0.086)
DTA	0.798	2.411***
	(0.725)	(0.541)

(*Continued on next page*)

TABLE 4, Continued

Variables	(1) *POS_SURPRISE*	(2) *NEG_SURPRISE*
EQUITY_COMP	2.435	1.525
	(2.424)	(1.927)
LEV	0.100	-0.235
	(0.319)	(0.263)
ROA	-31.454***	-13.461***
	(2.700)	(1.298)
MTB	0.056***	0.002
	(0.017)	(0.016)
ABACC	0.093	-0.109
	(0.094)	(0.069)
Constant	-1.573***	-2.646***
	(0.422)	(0.340)
Year Fixed Effects	YES	
Industry Fixed Effects	YES	
N	13,509	
Wald X^2 (p-value)	< 0.01	

Notes: This table presents the results of estimating a multinomial logistic regression with positive and negative ETR surprises (*POS_SURPRISE* and *NEG_SURPRISE*, respectively) as the outcomes.
*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p*-values are two-tailed and are calculated based on standard errors that are clustered by firm (Petersen 2009; Gow et al. 2010).
Appendix C provides variable definitions.

TABLE 5
Descriptive Statistics: Information Content Sample (n = 31,324)

Variables	Sig. Diff†	Mean	St Dev	25th Pctl	50th Pctl	75th Pctl
RETURN						
Overall sample		0.114	0.777	-0.264	0.001	0.312
High accuracy firms	n/s	0.107	0.586	-0.215	0.029	0.313
All other firms		0.116	0.827	-0.281	-0.007	0.312
Δ*PTBI*						
Overall sample		0.008	0.114	-0.019	0.010	0.036
High accuracy firms	n/s	0.008	0.071	-0.006	0.010	0.025
All other firms		0.008	0.124	-0.025	0.009	0.041
Δ*TI*						
Overall sample		0.005	0.121	-0.023	0.005	0.034
High accuracy firms	n/s	0.006	0.075	-0.012	0.007	0.026
All other firms		0.005	0.132	-0.028	0.005	0.038
GAAP_ETR5						
Overall sample		0.330	0.155	0.244	0.335	0.402
High accuracy firms	HA<AO	0.325	0.112	0.280	0.342	0.387
All other firms		0.331	0.165	0.231	0.331	0.410

Notes: This table presents descriptive statistics for 31,324 firm-year observations from 1993-2013. The "high accuracy firms" sample includes firm-years where prior ETR accuracy is in the top quartile (i.e., most accurate based on *3YR_ACCURACY*), ranked by two-digit SIC industry and year. The "all other firms" sample includes the remaining firm-years.

† Significant difference between high accuracy firms ("HA") and all other firms ("AO") based on t-test of means. High accuracy firms have significantly lower GAAP ETRs (p-value < 0.01) but not significantly different returns or changes in pretax book income or changes in taxable income.

Appendix C provides variable definitions.

TABLE 6
Information Content of Book and Estimated Taxable Income and the Role of Interim Tax Reporting Accuracy

DV = *RETURN*	Full Sample		Pre-SOX		Post-SOX	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ*PTBI*	1.792***	1.773***	1.817***	1.793***	1.722***	1.706***
	(0.043)	(0.043)	(0.079)	(0.079)	(0.048)	(0.048)
Δ*TI*	0.376***	0.523***	0.620***	0.856***	0.250***	0.346***
	(0.040)	(0.046)	(0.082)	(0.093)	(0.043)	(0.049)
3YR_ACCURACY		-0.015		0.005		-0.031**
		(0.011)		(0.021)		(0.013)
Δ*TIx3YR_ACCURACY*		0.695***		1.125***		0.456***
		(0.107)		(0.204)		(0.117)
Constant	0.100***	0.099***	0.080***	0.078***	0.113***	0.113***
	(0.004)	(0.004)	(0.008)	(0.008)	(0.005)	(0.005)
N	31,324	31,324	12,711	12,711	18,613	18,613
R-squared	0.087	0.088	0.086	0.089	0.090	0.091

Notes: This table presents the results of regressing contemporaneous returns (*RETURN*) on changes in pretax book income, estimated tax income, and the interaction of estimated taxable income and prior tax reporting accuracy (*3YR_ACCURACY*). *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p*-values are two-tailed and are calculated based on standard errors that are clustered by firm (Petersen 2009; Gow et al. 2010).
Appendix C provides variable definitions.

TABLE 7
Relative Information Content of Estimated Taxable Income and Book Income

Panel A: Relative information content of estimated taxable income to book income for high and low tax accuracy firms (split at the median of *3YR_ACCURACY*)

	High Accuracy Firms (Median)						Low Accuracy Firms (Median)					
Year	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}
Avg_Pre02	695	3.200	0.163	2.571	0.112	0.676	723	2.043	0.123	1.569	0.071	0.573
Avg_Post02	764	2.463	0.131	1.302	0.057	0.533	795	2.280	0.140	0.909	0.031	0.213***
Avg_Total	731	2.814	0.146	1.907	0.083	0.601	761	2.168	0.132	1.223	0.050	0.384***

Panel B: Relative information content of estimated taxable income to book income for high accuracy firms (top quartile of *3YR_ACCURACY*) and all other firms.

	High Accuracy Firms (Top Quartile)						All Other Firms					
Year	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}
Avg_Pre02	335	3.335	0.150	2.970	0.123	0.820	1,083	2.244	0.131	1.713	0.077	0.578**
Avg_Post02	368	2.598	0.139	1.437	0.063	0.559	1,191	2.290	0.133	0.981	0.034	0.258***
Avg_Total	352	2.949	0.144	2.167	0.092	0.683	1,140	2.268	0.132	1.330	0.054	0.410***

Panel C: Relative information content of estimated taxable income to book income for low accuracy firms (lowest quartile of *3YR_ACCURACY*) and all other firms.

	Low Accuracy Firms (Lowest Quartile)						All Other Firms					
Year	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}
Avg_Pre02	347	1.715	0.116	1.207	0.056	0.520	1,071	2.835	0.149	2.332	0.102	0.672*
Avg_Post02	380	2.014	0.134	0.644	0.028	0.206	1,178	2.612	0.136	1.286	0.045	0.331**
Avg_Total	365	1.871	0.125	0.912	0.041	0.356	1,127	2.718	0.142	1.784	0.072	0.493**

(*Continued on next page*)

TABLE 7, Continued

Panel D: Relative information content of estimated taxable income to book income for high and low tax accuracy firms (split at the median of *3YR_ACCURACY*) for a sample of firms matched on level of tax planning (based on *GAAP_ETR5*)

	High Accuracy Firms (Median)						Low Accuracy Firms (Median)					
Year	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}	Obs	ΔPTBI	R^2_{PTBI}	ΔTI	R^2_{TI}	R^2_{TI}/R^2_{PTBI}
Avg_Pre02	610	3.519	0.175	3.116	0.142	0.778	610	2.483	0.143	1.858	0.082	0.592*
Avg_Post02	648	2.549	0.133	1.503	0.071	0.844	648	1.786	0.126	0.827	0.043	0.366**
Avg_Total	632	2.990	0.152	2.236	0.103	0.814	632	2.103	0.134	1.296	0.061	0.469***

Notes:
*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p-values* are based on one-tailed t-tests and computed using the yearly values of R^2_{TI}/R^2_{PTBI} for high accuracy firms versus low accuracy firms. Inferences are unchanged if using Wilcoxon rank sum tests to calculate p-values.
Appendix C provides variable definitions.

TABLE 8
Cumulative Abnormal Returns Around Earnings Announcement for Firms that Beat Analysts' Forecast Target

DV = *CAR*	(1)	(2)
Intercept	0.003	0.003
	(0.002)	(0.002)
Beat_w_Tax	-0.004***	
	(0.001)	
Beat_w_Tax_Accurate		-0.001
		(0.003)
Beat_w_Tax_Inaccurate		-0.005***
		(0.002)
AFE	9.136***	9.148***
	(0.457)	(0.457)
BTM	0.004**	0.004**
	(0.002)	(0.002)
SIZE	-0.000	-0.000
	(0.000)	(0.000)
MOMENTUM	-0.075***	-0.075***
	(0.006)	(0.006)
N	18,223	18,223
R^2	0.029	0.029

Notes: This table presents the results of estimating Equation (4). *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p*-values are two-tailed and are calculated based on standard errors that are clustered by firm (Petersen 2009; Gow et al. 2010).
Appendix C provides variable definitions.

TABLE 9
De-Biased Accuracy Measure

Variables	(1) *ACC1_debiased*	(2) *ACC2_debiased*	(3) *ACC3_debiased*
Market participants			
AF	0.001	0.002**	0.002***
	(0.001)	(0.001)	(0.001)
EM	0.004*	0.004**	0.004**
	(0.002)	(0.002)	(0.002)
IO	0.011***	0.007***	0.007***
	(0.003)	(0.002)	(0.002)
Auditor Characteristics			
BIG4	-0.002	0.001	0.001
	(0.002)	(0.002)	(0.002)
APTS	0.009	0.003	0.002
	(0.006)	(0.005)	(0.004)
EXPERT	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)
TENURE	0.001	0.002***	0.003***
	(0.001)	(0.001)	(0.001)
OFFICE_SIZE	-0.001**	-0.000	-0.001*
	(0.001)	(0.000)	(0.000)
Firm Characteristics			
SIZE	0.003***	0.001**	0.002***
	(0.001)	(0.001)	(0.000)
GEO_SEGS	-0.005***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)
BUS_SEGS	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)
Δ*MIX*	-0.052***	-0.044***	-0.033***
	(0.003)	(0.003)	(0.002)
M&A	0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.001)
R&D	-0.140***	-0.109***	-0.086***
	(0.014)	(0.012)	(0.010)
Δ*SALES*	-0.006**	-0.003	-0.002
	(0.003)	(0.002)	(0.002)
EARN_VOL	-0.001***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)
DISC_EXTRA	-0.007***	-0.004***	-0.002**
	(0.002)	(0.001)	(0.001)
DTA	-0.042***	-0.031***	-0.026***
	(0.010)	(0.008)	(0.007)

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TABLE 9, Continued

Variables	(1) *ACC1_debiased*	(2) *ACC2_debiased*	(3) *ACC3_debiased*
EQUITY_COMP	-0.035	-0.088***	-0.055**
	(0.036)	(0.031)	(0.027)
LEV	-0.008*	-0.003	-0.001
	(0.005)	(0.004)	(0.003)
ROA	0.264***	0.243***	0.223***
	(0.013)	(0.011)	(0.010)
MTB	-0.001***	-0.000**	-0.001***
	(0.000)	(0.000)	(0.000)
ABACC	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)
Constant	-0.047***	-0.040***	-0.038***
	(0.006)	(0.005)	(0.004)
Year Fixed Effects	YES	YES	YES
Industry Fixed Effects	YES	YES	YES
R^2	0.114	0.110	0.106
N	13,509	13,509	13,509

Notes: This table presents the results of estimating Equation (1) after replacing the dependent variable with de-biased accuracy as the dependent variable.
*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. *p*-values are two-tailed and are calculated based on standard errors that are clustered by firm (Petersen 2009; Gow et al. 2010).
Appendix C provides variable definitions.

APPENDIX B

INTERIM ETR ESTIMATE EXAMPLE

Suppose a firm has operations in the U.S. and a foreign subsidiary with statutory tax rates of 35 percent and 25 percent, respectively.[1] The firm also has significant R&D expenditures, for which it anticipates a tax credit. For each interim period, the firm should calculate its tax expense using the integral method as follows:

In Q1, the firm projects annual pretax income of $100 in both the U.S. and its foreign subsidiary for a total of $200 annual pretax income. It also projects an R&D tax credit of $2 at the end of the year. Therefore, the firm projects $35 U.S. tax ($100 x 35%), $25 foreign tax ($100 x 25%), and a tax credit of $2 for a total tax expense of $58 ($35 + $25 - $2) for the year. The projected annual ETR as of Q1 is therefore 29% ($58 tax expense / $200 pre-tax income).

If the firm reports actual total pre-tax income in Q1 of $75, the firm accrues $21.75 ($75 x 29%) tax expense in Q1. Note that $75 is not proportional to projected annual pre-tax income and $21.75 is not proportional to projected total tax expense; the tax expense accrued should reflect projected ETR at the end of the year, so is applied to each quarter on a *pro rata* basis. The following table summarizes this calculation:

Q1 Projection:	Pretax Income	Tax Rate	Tax
U.S.	$100	35%	$35
Foreign	$100	25%	$25
		Tax Credit	$(2)
		Total Tax Expense	$58
		Projected ETR	29%
Q1 actual pretax income	$75		
Apply projected ETR	29%		
Q1 tax expense	$21.75		

In Q2, the firm projects annual pretax income of $200, however, now $130 is projected in the U.S. and $70 is projected in the foreign jurisdiction. The projected R&D tax credit remains $2. Therefore, the projected tax rate in Q2 is 30.5% ((($130x35%) + ($70x25%)-$2)/$200). If the firm reports year-to-date pre-tax income in Q2 of $120, year-to-date tax expense should be $36.60 ($120x30.5%) to reflect the projected annual ETR. Because $21.75 of tax expense was accrued in Q1, the Q2 tax expense is $14.85 ($36.60 - $21.75). The following table summarizes this calculation:

Q2 Projection:	Pretax Income	Tax Rate	Tax
U.S.	$130	35%	$45.5
Foreign	$70	25%	$17.5
		Tax Credit	$(2)
		Total Tax Expense	$61
		Projected ETR	30.5%
Q2 year-to-date pretax income	$120		
Apply projected ETR	30.5%		
Year-to-date tax expense	$36.60		
Less Q1 tax expense accrued	$21.75		
Q2 tax expense	$14.85		

[A1] Note that under ASC 740-30-25-17 (formerly APB 23), when firms designate unremitted foreign earnings as permanently or indefinitely reinvested, they are not required to accrue deferred tax expense on those earnings.

In Q3, the firm does not change its projected U.S. or foreign pre-tax income. However, the firm anticipates an increase in the R&D credit to $4. Therefore, the projected tax rate in Q3 is 29.5%. If the firm reports year-to-date pre-tax income in Q3 of $160, year-to-date tax expense should be $47.20 to reflect the projected annual ETR. Because $36.60 was accrued through Q2, the Q3 tax expense is $10.60. The following table summarizes this calculation:

Q3 Projection:	Pretax Income	Tax Rate	Tax
U.S.	$130	35%	$45.5
Foreign	$70	25%	$17.5
		Tax Credit	$(4)
		Total Tax Expense	$59
		Projected ETR	29.5%
Q3 year-to-date pretax income	$160		
Apply projected ETR	29.5%		
Year-to-date tax expense	$47.20		
Less tax expense accrued	$36.60		
Q3 tax expense	$10.60		

In Q4, the firm realizes its total annual income of $180, with $110 in the U.S. and $70 in the foreign jurisdiction. The R&D credit is anticipated to be $4 when the tax return is filed. Therefore, the tax rate at year end is 28.89% and total tax expense is $52. Because $47.2 of tax expense was accrued in Q1-Q3, tax expense for the fourth quarter is $4.80 to reflect annual tax expense. The following table summarizes this calculation:

Q4:	Pretax Income	Tax Rate	Tax
U.S.	$110	35%	$38.5
Foreign	$70	25%	$17.5
		Tax Credit	$(4)
		Total Tax Expense	$52
		ETR	28.89%
Annual pretax income	$180		
Apply projected ETR	28.89%		
Year-to-date tax expense	$52		
Less tax expense accrued	$47.20		
Q4 tax expense	$4.80		

The interim ETR estimates are summarized as follows:

Quarter	Estimated ETR	Change from Prior Quarter	Difference from annual	EPS effect (compared to prior ETR estimate)
1	29.00	-	+0.11	
2	30.50	+1.50	+1.61	-2.11%
3	29.50	-1.00	+0.61	+1.44%
4	28.89	-0.61	-	+0.86%

The EPS effect is calculated by dividing the change from prior quarter by (1-prior quarter ETR estimate). For example, if the quarter's pre-tax earnings was $10, after-tax EPS is $7.10 (10x(1-0.290)) using the Q1 ETR estimate; however, using the second quarter ETR estimate, after-tax EPS is $6.95 (10x(1-0.305)), a decrease of 2.11%.

In this example, the firm has relatively accurate ETR estimates compared to those in my sample; however, note that even relatively small changes in ETR have a significant effect on after-tax EPS.

APPENDIX C

VARIABLE DEFINITIONS

Primary dependent variables	
ACCURACY1	Absolute value of the difference between the year-to-date ETR in the first quarter and the year-end ETR, multiplied by negative one.
ACCURACY2	Absolute value of the difference between the year-to-date ETR in the second quarter and the year-end ETR, multiplied by negative one.
ACCURACY3	Absolute value of the difference between the year-to-date ETR in the third quarter and the year-end ETR, multiplied by negative one.
Δ*Q1Q4*	Year-end ETR minus year-to-date ETR in the first quarter.
Δ*Q2Q4*	Year-end ETR minus year-to-date ETR in the second quarter.
Δ*Q3Q4*	Year-end ETR minus year-to-date ETR in the second quarter.
ACC1_debiased	Absolute value of the de-biased Δ*Q1Q4*, multiplied by negative one. The de-biased Δ*Q1Q4* is the actual Δ*Q1Q4* minus the predicted bias based on coefficient estimates of a regression of Δ*Q1Q4* on variables included in Equation (1).
ACC2_debiased	Absolute value of the de-biased Δ*Q2Q4*, multiplied by negative one. The de-biased Δ*Q1Q4* is the actual Δ*Q2Q4* minus the predicted bias based on coefficient estimates of a regression of Δ*Q2Q4* on variables included in Equation (1).
ACC3_debiased	Absolute value of the de-biased Δ*Q3Q4*, multiplied by negative one. The de-biased Δ*Q1Q4* is the actual Δ*Q3Q4* minus the predicted bias based on coefficient estimates of a regression of Δ*Q3Q4* on variables included in Equation (1).
Firm characteristics	
ABACC	Abnormal accruals for year t based on the performance-adjusted modified Jones Model (Kothari et al. 2005).
BUS_SEG	Natural log of the number of business segments of the company.
DISC_EXTRA	Indicator variable equal to 1 if the firm has non-zero discontinued operations (Compustat DO) or extraordinary items (Compustat XI) during the year, zero otherwise.
DTA	Total net deferred tax assets at the beginning of the year (Compustat TXNDB) scaled by lagged total assets (Compustat AT).
EARN_VOL	Standard deviation of earnings per share over the prior five years scaled by total assets.
EQUITY_COMP	Stock compensation expense (Compustat STKCO) scaled by total sales (Compustat SALE)
GEO_SEG	Natural log of the number of geographic segments of the company.
Δ*SALES*	Sales growth, measured as the absolute value of: sales in year *t* less sales in year *t*-1, scaled by sales in year *t*-1.
LEV	Long-term-debt-to-asset ratio at the end of year t (DLTT) scaled by total assets at the end of the year (Compustat AT).
M&A	Indicator variable equal to 1 if firm participated in any merger and acquisition activity during year *t*; 0 otherwise. Merger and acquisition activity is determined based on non-zero acquisition expense (AQP).
Δ*MIX*	Change in geographic mix of income, measured as the absolute value of: foreign pretax income (Compustat PIFO) divided by total pretax income (Compustat PI) in year *t* minus foreign pretax income divided by total pretax income in year *t*-1.

MTB	Market-to-book ratio for the end of year *t*, measured as market value of equity (PRCC_F x CSHO) divided by book value of equity (CEQ).
PERM_DIFF	Absolute value of year-end GAAP ETR (Compustat TXT divided by PI) minus 0.35.
R&D	R&D expense for year t (XRD) scaled by total assets at the beginning of the year (AT).
ROA	Return on assets for year *t*, measured as the ratio of pre-tax income (PI) to the average of total assets for the year (AT).
SIZE	Natural log of market value of equity for the company at the beginning of year *t*.
Auditor characteristics	
APTS	Tax fees divided by total fees paid to the auditor
BIG4	Indicator variable equal to 1 if audited by a Big 4 firm; 0 otherwise.
OFFICE_SIZE	Natural log of the number of clients audited by the office in year t.
EXPERT	Indicator variable equal to 1 if an audit firm is both an audit and tax expert; 0 otherwise. Audit and tax expertise follows McGuire, Omer, and Wang (2012). An audit office is defined as an industry audit (tax) expert if its market share in a given MSA (city) and industry (two-digit SIC) is greater than or equal to 30 percent. Market share is defined as total audit (tax) fees paid to the audit firm divided by total audit (tax) fees paid to all other audit firms in the same industry and MSA.
AUDIT_EXPERT	Indicator variable equal to 1 if an audit firm is an audit expert; 0 otherwise. Audit expertise follows McGuire, Omer, and Wang (2012).
TAX_EXPERT	Indicator variable equal to 1 if an audit firm is a tax expert; 0 otherwise. Tax expertise follows McGuire, Omer, and Wang (2012).
TENURE	Natural log of the number of years the audit firm audited the client.
Analyst-related variables	
AF	Natural log of the number of analysts following the company in the year t.
EM	Indicator variable equal to 1 if the company would have missed the last consensus analyst forecast using the previous quarter's ETR within five cents; zero otherwise.
Institutional ownership variable	
IO	Percentage of shares owned by institutions at the beginning of the year.
Additional variables for self-selection correction	
CASH	Cash holding at the end of year t (CHE) scaled by total assets at the beginning of year (AT).
DEP	Depreciation and amortization expense for year t (DP) divided by total assets at the beginning of the year (AT).
EQINC	Equity income for year t (ESUB) scaled by total assets at the beginning of the year (AT).
IMR	Inverse Mills ratio calculated based on the coefficient estimates from Equation (2).
LNAUDFEES	Natural log of audit fees received from the client.
OPPORTUNITY	Market value of a client divided by the sum of the market value of all clients in the same industry at the same MSA city.
PPE	Net PPE for year t (PPENT) scaled by total assets at the beginning of the year (AT).

SEC_TIER	Indicator variable equal to 1 if audited by a second-tier accounting firm, namely, Grant Thornton LLP and BDO Seidman LLP; 0 otherwise.
Variables for market response tests	
RETURN	Buy-and-hold market-adjusted (value-weighted) return for security *j* over the 16-month return window starting at the beginning of fiscal year *t* and ending 4 months after the end of fiscal year *t.*
Δ*PTBI*	Change in pretax book income (PTBI) from year *t*-1 to year *t*, scaled by market value of equity (MVE) at beginning of year *t*. PTBI is computed as pretax book income (Compustat PI) less minority interest (Compustat MII). MVE is computed as Compustat PRCC_F x CSHO.
Δ*TI*	Change in estimated taxable income (TI) from year *t*-1 to year *t*, scaled by market value of equity (MVE) at beginning of year *t*. TI is computed as [(FTE + FOTE)/0.35] - ΔNOL, where FTE is current federal income tax expense (Compustat TXFED), FOTE is current foreign tax expense (Compustat TXFO), 0.35 is the top U.S. statutory tax rate for the sample period (1993 and later), and ΔNOL is change in net operating loss carryforwards (Compustat TLCF). MVE is computed as Compustat PRCC_F x CSHO. If federal income tax expense is missing from Compustat, TI is estimated as the difference between total income tax expense (Compustat TXT) and deferred taxes (Compustat TXDI) divided by 0.35, less the change in NOL carryforwards.
3YR_ACCURACY	Annual quartile rank by 2-digit SIC of prior three year tax reporting accuracy (year t-3 to t-1), scaled to range between -0.5 and -0.5. Prior reporting accuracy is computed as the sum of the absolute value of the differences between year-end ETR and estimated ETR in quarters 1, 2, and 3 over the prior three years. There are three differences each year, so cumulative three year tax reporting accuracy is based on nine differences. The sum is multiplied by negative one so higher values indicate greater accuracy, and those values are ranked into quartiles and ranks are then scaled to range between -0.5 and 0.5.
GAAP_ETR5	Accumulated GAAP ETR over prior five years, calculated as the sum of current tax expense (Compustat TXT less TXDI) over the prior five years (years *t*-4 to year *t*) divided by the pretax book income (Compustat PI) over the prior five years.
CAR	Cumulative return for the five-day window around the earnings announcement (day -2 to day +2) minus the cumulative return for an equal-weighted portfolio of firms in the same CRSP size decile.
BEAT_W_TAX	Indicator variable equal to 1 if the firm would have missed analysts' forecast without a change in ETR from quarter 3 to quarter 4, zero otherwise.
BEAT_W_TAX_ACCURATE	Indicator variable equal to 1 if the firm would have missed analysts' forecast without a change in ETR from quarter 3 to quarter 4 and the firms' prior *3YR_ACCURACY* is above the median, zero otherwise.
BEAT_W_TAX_INACCURATE	Indicator variable equal to 1 if the firm would have missed analysts' forecast without a change in ETR from quarter 3 to quarter 4 and the firms' prior *3YR_ACCURACY* is below the median, zero otherwise.
AFE	Actual earnings per share reported by I/B/E/S minus the last I/B/E/S consensus forecast, divided by stock price at the end of the fiscal year.

BTM	Book-to-market ratio, measured as book value of equity (CEQ) divided by market value of equity (PRCC_F x CSHO).
SIZE	Natural log of total assets at the end of the year.
MOMENTUM	Cumulative size-adjusted returns for the six months prior to the earnings announcement, ending three days before the earnings announcement.